

# INSTALLATION RESTORATION PROGRAM

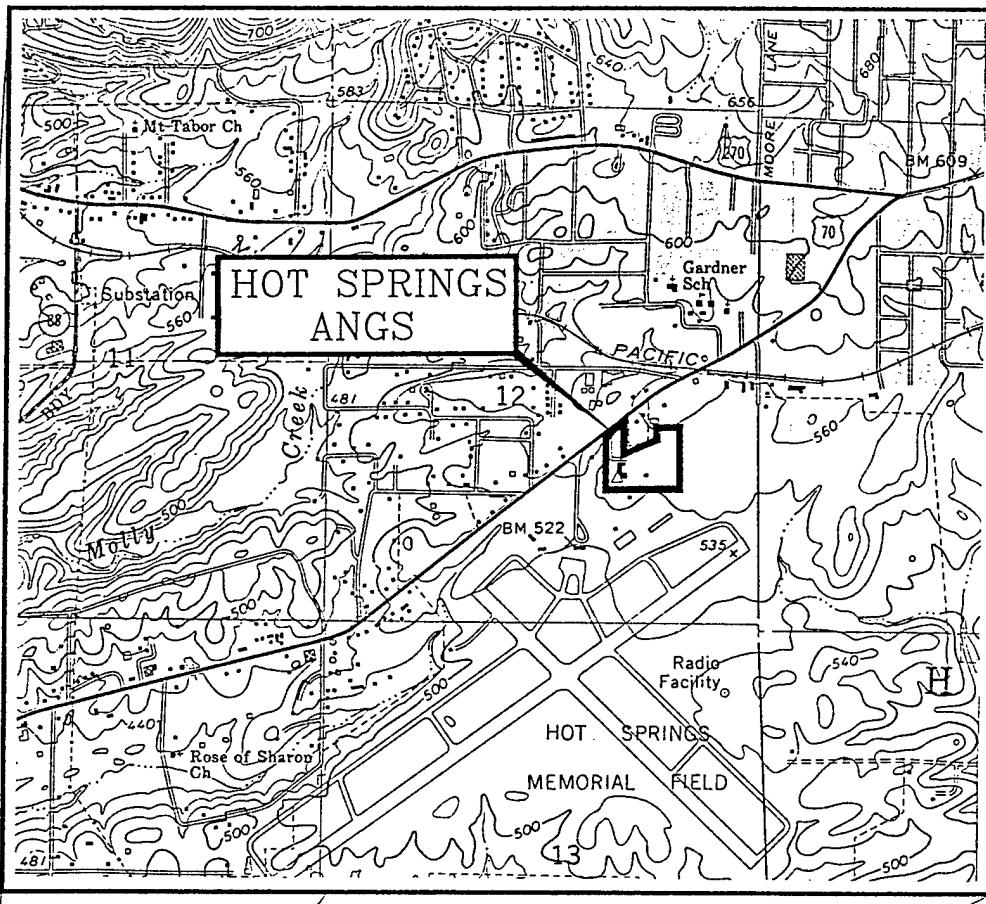
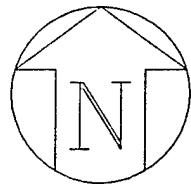
## PRELIMINARY ASSESSMENT/ SITE INSPECTION

### VOLUME I

223rd COMBAT COMMUNICATIONS SQUADRON  
HOT SPRINGS AIR NATIONAL GUARD STATION  
ARKANSAS AIR NATIONAL GUARD  
HOT SPRINGS, ARKANSAS  
JULY 1995



AIR NATIONAL GUARD READINESS CENTER  
ANDREWS AFB, MARYLAND



A map of the state of Arkansas. A callout box is positioned in the eastern part of the state, pointing towards the city of Hot Springs. The callout box contains the text "HOT SPRINGS" in capital letters, with a small black square marker indicating the exact location on the map.

SOURCE : USGS 7.5 MINUTE TOPOGRAPHIC MAP, HOT SPRINGS SOUTH, ARK, 1976.

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SCALE IN FEET

INSIDE  
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HOTSPRNG\INFRONT

HOTSPRNG\INFRONT

STATION LOCATION MAP  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

OPTECH  
OPERATIONAL TECHNOLOGIES  
CORPORATION

JULY 1995

# **INSTALLATION RESTORATION PROGRAM**

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### **VOLUME I**

**223rd COMBAT COMMUNICATIONS SQUADRON  
HOT SPRINGS AIR NATIONAL GUARD STATION  
ARKANSAS AIR NATIONAL GUARD  
HOT SPRINGS, ARKANSAS**

**JULY 1995**

*Prepared For*

**AIR NATIONAL GUARD READINESS CENTER  
ANDREWS AFB, MARYLAND**

*Prepared By*

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Hot Springs, Arkansas

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**LIST OF ACRONYMS**

AGE	Aerospace Ground Equipment
ANG	Air National Guard
ANGRC	Air National Guard Readiness Center
ANGRC/CEVR	Air National Guard Readiness Center/Installation Restoration Program Branch
ANGS	Air National Guard Station
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ATHA	Ambient temperature headspace analysis
BLS	Below land surface
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CBCS	Combat Communications Squadron
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQP	Corporate Environmental Quality Assurance/Quality Control Plan
CIV	Civilian Contractor (Safety Kleen Corp.)
CTS	Current Temporary Waste Storage
DERP	Defense Environmental Restoration Program
DL	Detection Limit
DoD	Department of Defense
DOT	Department of Transportation
DPC&E	Department of Pollution Control and Ecology
DRMO	Defense Reutilization and Marketing Office
EO	Executive Order
FPDWS	Federal Primary Drinking Water Standards
FS	Feasibility Study
GC	Gas chromatograph
HM/HW	Hazardous materials/hazardous wastes
HRS	Hazard Ranking System
HSA	Hollow-stem auger
ICP	Inductively-coupled plasma
ID	Identification
in/hr	Inches per hour
IRP	Installation Restoration Program
LRAFB	Little Rock Air Force Base
MCLs	Maximum contaminant levels
$\mu\text{g}/\text{kg}$	Micrograms per kilogram
mg/kg	Milligrams per kilogram
mmhos	Millimhos
$\mu\text{g}/\text{L}$	Micrograms per liter
mL	Milliliter
MOGAS	Motor Vehicle Gasoline
MSL	Mean sea level

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**LIST OF ACRONYMS (Concluded)**

NEF	Northeast and East Fence Line
NPDES	National Pollutant Discharge Elimination System
NWD	Northwest Ditch
ODS	Old Drum Storage
OpTech	Operational Technologies Corporation
PA	Preliminary Assessment
PAH	Polyaromatic hydrocarbons
PA/SI	Preliminary Assessment/Site Inspection
PCB	Polychlorinated biphenyl
PID	Photoionization detector
POV	Privately-owned vehicles
ppb	Parts per billion
PPE	Personal Protective Equipment
ppm	Parts per million
RI/FS	Remedial Investigation/Feasibility Study
RPG	Registered Professional Geologist
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOW	Scope of work
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TCLP	Toxic Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
UIP	Used in process
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOA	Volatile organic analysis
VOC	Volatile Organic Compound

# **INSTALLATION RESTORATION PROGRAM PRELIMINARY ASSESSMENT/SITE INSPECTION**

## **EXECUTIVE SUMMARY**

### **ES 1.0 INTRODUCTION**

A Preliminary Assessment/Site Inspection (PA/SI) was conducted at the 223rd Combat Communications Squadron (CBCS), Hot Springs Air National Guard Station (ANGS), Hot Springs, Arkansas. The Air National Guard Readiness Center/Installation Restoration Program Branch (ANGRC/CEVR) authorized Operational Technologies Corporation (OpTech) to prepare a PA/SI work plan and conduct the SI at the Hot Springs ANGS. A PA of the 223rd CBCS, Hot Springs ANGS, was initiated by ANGRC and OpTech personnel in October 1993. Information obtained through interviews, review of Station records, and field observations resulted in the identification of four potentially contaminated disposal and/or spill areas. These areas are designated as the Old Drum Storage (ODS) Area of Concern (AOC), the Northeast and East Fence Line (NEF) AOC, the Current Temporary Waste Storage (CTS) AOC, and the Northwest Ditch (NWD) AOC. The SI was conducted as outlined in the PA/SI Work Plan submitted to ANGRC/CEVR in November 1993 and approved in January 1994. The field work commenced at the 223rd CBCS on 23 February 1994 and was completed on 28 February 1994.

### **ES 2.0 INVESTIGATIONS AT THE AREAS OF CONCERN**

Twenty-six soil samples, one surface water sample, and one sediment sample were submitted for analysis of volatile organic compounds (VOC), semivolatile organic compounds (SVOC), priority pollutant metals, and total petroleum hydrocarbons (TPH) from the four AOCs. VOCs were detected in soil from 23 of the 28 samples obtained with a majority suspected of being laboratory induced contaminants. VOCs detected in soil which were not attributable to laboratory contamination did not exceed the Arkansas Department of Pollution Control and Ecology (DPC&E) limits for soil. SVOCs were detected in soil from eight of the 28 samples analyzed and consisted primarily of one or more polycyclic aromatic hydrocarbons (PAH). Thirteen priority pollutant metals were variously detected in soil from all 28 investigative samples and TPH was detected in soil from three of the 28 samples analyzed, but did not exceed the Arkansas DPC&E limit for TPH.

### **ES 2.1 OLD DRUM STORAGE AOC**

The Old Drum Storage AOC is located along the fence line immediately west of the current washrack. The area is covered by original asphalt pavement on its eastern portion and by grass on its western portion. Five investigative soil samples were obtained from four boring locations at this area.

No VOCs or TPH were detected in soil from the AOC. No metals analyzed for were detected in soil in excess of Toxic Characteristic Leaching Procedure (TCLP) estimated action levels. PAH contamination was detected in soil from two boring locations, ODS-001BH and ODS-002BH. PAH contamination in soil was detected at the surface sample interval with soil from the second sample interval above the bedrock not detecting PAH contamination. The significance of PAH contamination at the site is not determined since Arkansas DPC&E determines action levels for PAHs in soil on a case-by-case basis.

### **ES 2.2 NORTHEAST AND EAST FENCE LINE AOC**

The Northeast and East Fence Line AOC is located along the entire eastern fence of the Station and along a portion of the Station's northern fence in the northeast portion of the property. Inside the fence, the area is covered with asphalt for vehicle parking; just outside the fence, natural soil, vegetation (grasses and grapevine), and rock outcrops are present. Nine investigative soil samples were obtained from five boring locations at this area.

No VOC concentrations detected in soil at the AOC exceeded DPC&E limits. No SVOCs or TPH were detected in soil from the AOC, and no concentrations of metals analyzed for were detected in excess of TCLP-estimated action levels.

### **ES 2.3 CURRENT TEMPORARY WASTE STORAGE AOC**

The Current Temporary Waste Storage AOC is located on the south edge of the Station, between Buildings 100 and 102. This area has been used for drummed waste storage since the late 1970s. The drums are set on a concrete pad which is raised slightly above the surrounding asphalt, with a capacity for storage of approximately 9-12 drums. Six investigative soil samples were obtained from three boring locations and one surface sample location at this area.

No VOCs or TPH were detected in soil from the AOC in concentrations exceeding DPC&E action levels and no metals analyzed for were detected in excess of TCLP-estimated action

levels. PAH contamination was detected in soil at only one boring location, CTS-004SF, at the surface sample interval. PAHs were not detected in soil from the second sample interval above the bedrock at that location.

#### **ES 2.4 NORTHWEST DITCH AOC**

The Northwest Ditch AOC is a former open drainage ditch located north of the privately-owned vehicles (POV) parking area and Building 100. The ditch was used from 1957 until the mid-1970s. The ditch was replaced by a buried storm sewer in the mid-1970s. The storm sewer is oriented east to west and opens at the eastern edge of a culvert which runs under the main driveway into the Station. Six investigative soil samples were obtained from five boring locations at this area. Additionally, one surface sediment sample and one surface water sample was obtained at this AOC and submitted for analytical analysis.

No VOCs were detected in soil from the AOC that exceeded DPC&E action levels. The surface water sample had a VOC, trichloroethene, which exceeded Federal Primary Drinking Water Standards (FPDWS). PAH contamination was detected in soil from three boring locations, NWD-001BH, NWD-002BH, and NWD-006SD at the surface sample interval of the boring. Soil, analyzed from the second sample interval above the bedrock, did not show PAH contamination.

Several metals were detected in the sediment sample and surface water sample at concentrations which exceeded action levels. Lead was detected in sediment sample NWD-006SD which exceeded the TCLP-estimated action level (the DPC&E determines action levels for metals in soils also on a case-by-case basis). In the surface water sample NWD-005SW, cadmium, chromium, lead, and mercury, were detected in concentrations which exceeded FPDWS.

#### **ES 3.0 RECOMMENDATIONS**

##### **ES 3.1 OLD DRUM STORAGE AOC**

Based on the results of the PA/SI conducted, further investigation may be required to determine the extent of PAH contamination at the Old Drum Storage AOC. The Arkansas DPC&E determines action levels for SVOC or PAH contamination in soil on a case-by-case basis.

### **ES 3.2 NORTHEAST AND EAST FENCE LINE AOC**

Based on the results of the PA/SI conducted, contamination above action levels was not identified. Therefore, no additional Installation Restoration Program (IRP) activities are warranted at the Northeast and East Fence Line AOC.

### **ES 3.3 CURRENT TEMPORARY WASTE STORAGE AOC**

Based on the results of the PA/SI conducted, only one surface soil sample contained concentrations of PAH contamination that may exceed State action levels at the Current Temporary Waste Storage AOC. The Arkansas DPC&E determines action levels for SVOC or PAH contamination in soil on a case-by-case basis. Since this is a single point of contamination and does not represent widespread contamination at the site, no additional IRP activities are warranted at the Current Temporary Waste Storage AOC.

### **ES 3.4 NORTHWEST DITCH AOC**

Based on the results of the PA/SI conducted, the following recommendations are presented:

1. Determine the extent of PAH contamination detected at locations NWD-001BH, NWD-002BH, and NWD-006SD. The Arkansas DPC&E determines action levels for SVOC or PAH contamination in soil on a case-by-case basis.
2. Conduct additional investigation at the AOC to determine the source and extent of cadmium, chromium, lead, mercury, and trichloroethene contamination identified in the surface water (NWD-005SW) and sediment (NWD-006SD) samples.

## **SECTION 1.0 INTRODUCTION**

### **1.1 BACKGROUND**

This Preliminary Assessment/Site Inspection (PA/SI) report presents the results of the inspection activities conducted at the 223rd Combat Communications Squadron (CBCS), Hot Springs Air National Guard Station (ANGS), Hot Springs, Arkansas (see Inside Front Cover Figure). The Air National Guard Readiness Center/Installation Restoration Program Branch (ANGRC/CEVR) authorized Operational Technologies Corporation (OpTech) to prepare a PA/SI Work Plan and conduct the SI at the Hot Springs ANGS. A PA of the 223rd CBCS, Hot Springs ANGS, was initiated by ANGRC and OpTech personnel in October 1993. Information obtained through interviews, review of Station records, and field observations resulted in the identification of four potentially contaminated disposal and/or spill areas. These areas are designated as the Old Drum Storage Area of Concern (AOC), the Northeast and East Fence Line AOC, the Current Temporary Waste Storage AOC, and the Northwest Ditch AOC. The SI was conducted as outlined in the PA/SI Work Plan submitted to ANGRC/CEVR in November 1993 and approved in January 1994. The PA/SI is conducted under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

The Defense Environmental Restoration Program (DERP) was established in 1984 to promote and coordinate efforts for the evaluation and cleanup of contamination at Department of Defense (DoD) installations. On 23 January 1987, Presidential Executive Order (EO) 12580 assigned specific responsibility to the Secretary of Defense for carrying out DERP within the overall framework of the SARA and CERCLA of 1980. The IRP was established under DERP to identify, investigate, and clean up contamination at DoD installations. The Installation Restoration Program (IRP) focused on cleanup of contamination associated with past DoD activities to ensure that threats to public health were eliminated and natural resources were restored for future use. Within the Air National Guard, ANGRC/CEVR manages the IRP and related activities.

### **1.2 PURPOSE**

The overall objective of the PA/SI was to identify and evaluate potential areas of concern associated with past waste handling procedures, disposal and spill areas. This objective has been met through the PA and SI activities. The PA consisted of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill areas that might pose a

potential and/or actual hazard to public health, public welfare, or the environment. The SI consisted of field activities designed to confirm or deny the presence or absence of contamination at the AOCs identified in the PA. In addition, this PA/SI report provides specific information required to complete the Hazard Ranking System (HRS) "Data Requirements for Federal Facility Docket Sites" (Appendix A).

The specific objectives of the PA/SI were to:

- Identify all operations at the Station that have used hazardous materials or have generated hazardous waste.
- Obtain available geological, hydrological, meteorological, and environmental data and define hydrogeologic conditions that affect contaminant migration, containment, or cleanup.
- Provide data to assist in determining the presence, type, magnitudes, or absence of contamination at AOCs.
- Support site-specific decisions, such as no further action or identification of those AOCs requiring further investigation in the form of a Remedial Investigation/Feasibility Study (RI/FS).

### **1.3 SCOPE**

The scope of work (SOW) for the PA/SI was to identify potential areas of concern through PA activities and to confirm or deny the presence or absence of contamination associated with past hazardous material and hazardous waste handling and disposal through SI activities. The scope was limited to areas under the primary control of Hot Springs ANGS. Also, the scope was limited in that the extent of contamination at AOCs and the extent of possible threats to human health and the environment were not determined during this PA/SI. Therefore, within these limits, the PA/SI included the following actions: the identification of AOCs at or under primary control of the ANGS and the evaluation of potential receptors; the definition of the nature of releases at identified AOCs; the confirmation of the absence or presence of soil, sediment, and surface water contamination; and description of the geologic conditions of the installation study area, including the subsurface soil types and the presence or absence of hydrogeologic confining layers. The results of this PA/SI provide the technical basis needed to reach a decision point for each AOC.

## **1.4 METHODOLOGY**

### **1.4.1 Preliminary Assessment Process**

The purpose of the PA is to identify and evaluate the historical use, disposal, or release of hazardous materials and hazardous wastes (HM/HW) on an installation that may pose a potential or actual hazard to public health, public welfare, or the environment. A flow chart of the PA Methodology employed at Hot Springs ANGS is presented in Figure 1.1.

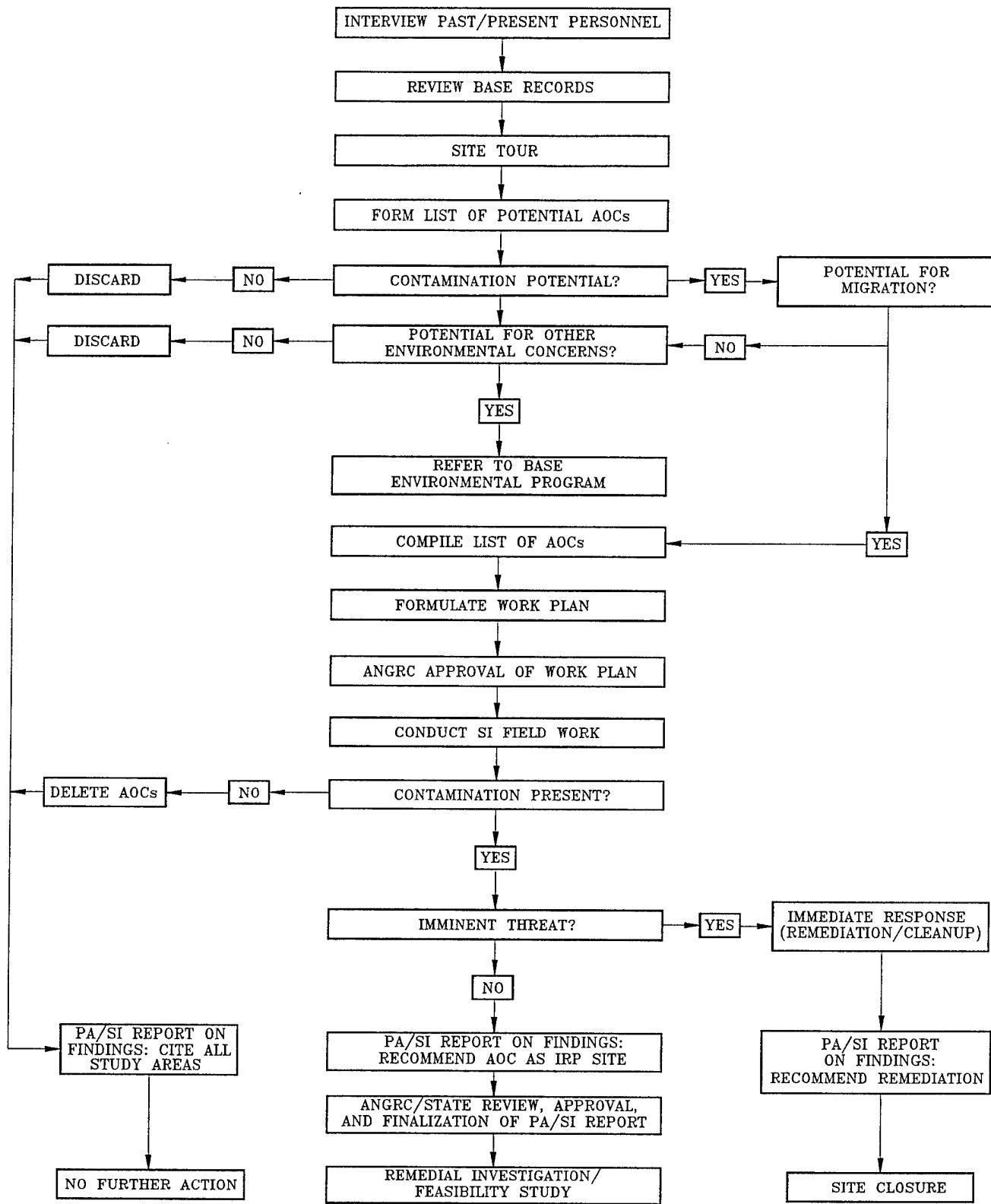
The PA began with a visit to Hot Springs ANGS to evaluate both past and present HM/HW handling procedures in order to determine whether any environmental contamination has occurred. The evaluation of past HM/HW handling practices was facilitated by interviews with seven current and retired Station personnel familiar with the various operating procedures at the Station. These interviews defined the areas at the Station where HM/HW was stored, spilled, disposed of, or otherwise released into the environment.

Historic records from Station files were collected and reviewed to supplement the information obtained from the interviews. Using this information, a list of four past waste spill/disposal areas on the Station was identified for further evaluation. A general survey tour of the identified spill/disposal areas and the Station was conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, and residences.

Detailed geological, hydrological, meteorological, developmental (land use and zoning), and environmental data for the Hot Springs area were also obtained from appropriate Federal, State, and local agencies. Following a detailed analysis of all the information obtained, the four AOCs were identified, described in detail and recommended for SI activities included in the PA/SI Work Plan.

### **1.4.2 Site Inspection Process**

The purpose of the SI is to perform field activities to confirm or deny the presence or absence of contamination at each of the identified AOCs. The SI was accomplished at Hot Springs ANGS by installing soil borings at all four AOCs, collecting subsurface soil samples, and collecting sediment and/or surface water samples at two of the AOCs. These samples were field screened using a photoionization detector (PID) and a field gas chromatograph (GC), and were subsequently analyzed for laboratory parameters related to the suspected contaminants



SOURCE: ANGRC/CEVR, 1994.

FIGURE 1.1

FORMS\PASI

PRELIMINARY ASSESSMENT/SITE  
INSPECTION METHODOLOGY CHART

223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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identified in the PA. The findings of both the initial PA Station visit and the SI field activities are presented in this PA/SI Report.

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## **SECTION 2.0 INSTALLATION DESCRIPTION**

### **2.1 LOCATION**

The city of Hot Springs is located in west central Arkansas at the southeastern edge of the Ouachita Mountains, approximately 50 miles southwest of Little Rock (see Figure 2.1). Hot Springs ANGS is located at the Hot Springs Memorial Airport, southeast quadrant, Section 12, Township 3S, Range 20W, Garland County, Hot Springs, Arkansas (see Figure 2.2). The Station, located within the city limits of Hot Springs, is approximately 2.8 miles southwest of downtown Hot Springs and 2 miles northeast of Lake Hamilton. The Station consists of 6.87 acres of land which is leased from the city of Hot Springs. The location and boundaries of the Station are shown in Figure 2.3. Currently there is a proposal to increase the size of the Station by leasing 8.07 additional acres adjacent to the Station from the city. This additional acreage is located primarily east and south of the current Station boundaries.

As shown in Figure 2.3, Hot Springs ANGS consists of a main building for operations and training (Building 100), smaller buildings associated with storage of equipment (Buildings 102 and 104), and canopies for vehicle maintenance and parking. Hot Springs ANGS has a weekday work population of 25 people; during training weekends, the population rises to 153 people.

### **2.2 ORGANIZATION AND HISTORY**

The 223rd Radio Relay Squadron of the Air National Guard was established in 1953. The Unit operated out of temporary facilities at other locations in the area until the current Station was built in 1957. The Unit has always had the same mission: to maintain and deploy tactical communications equipment in support of Air Force and Air Guard flying missions. The Unit's designation changed from Radio Relay Squadron to Mobile Communications Squadron, before becoming the CBCS. Since the original Station construction, ANG-sponsored facility improvements have included additions to the main building for a lecture hall, storage room, aerospace ground equipment (AGE) maintenance area, and teletype maintenance area, as well as a warehouse, new fuel island and underground storage tanks (USTs), new washrack, and canopies for vehicle parking.

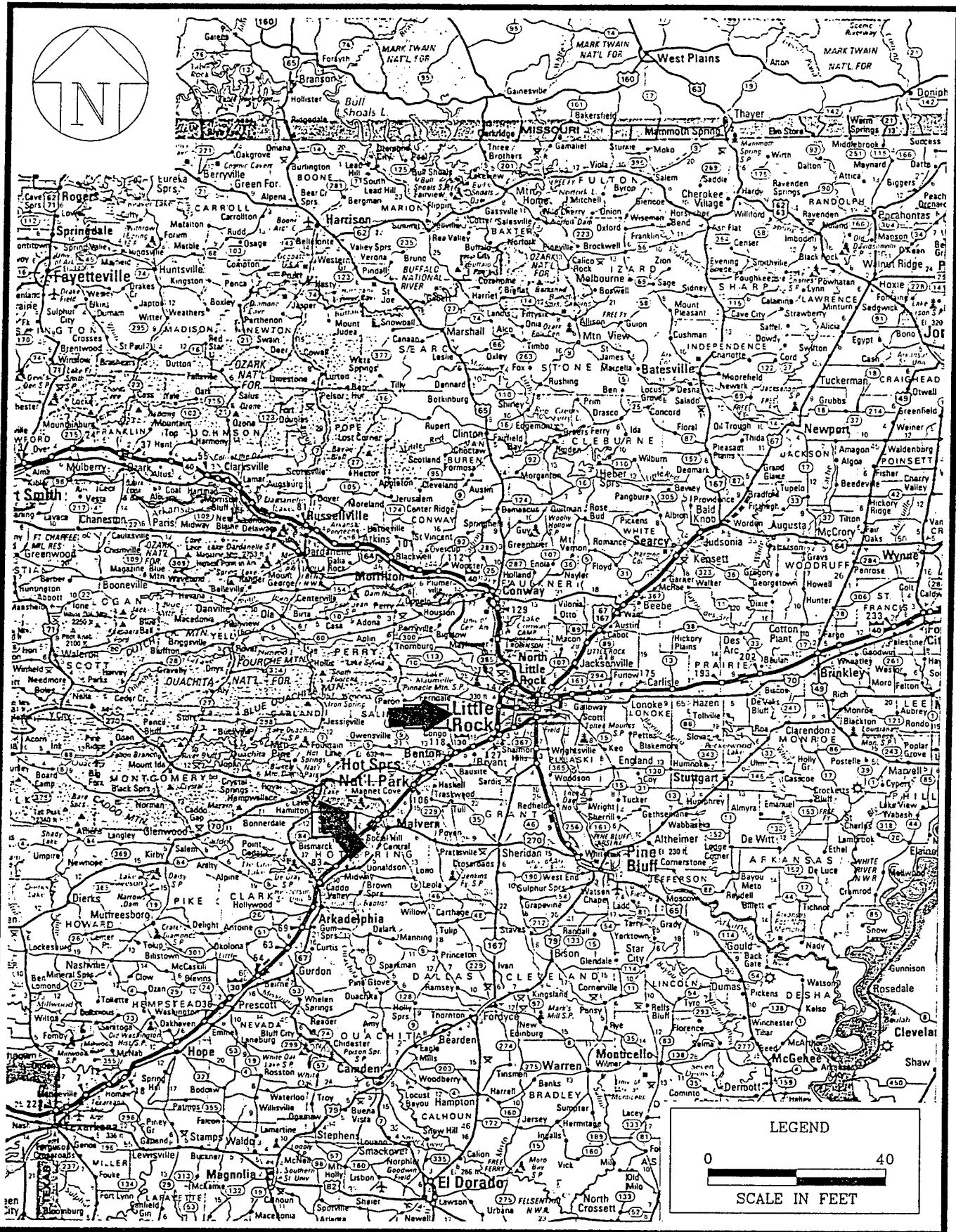


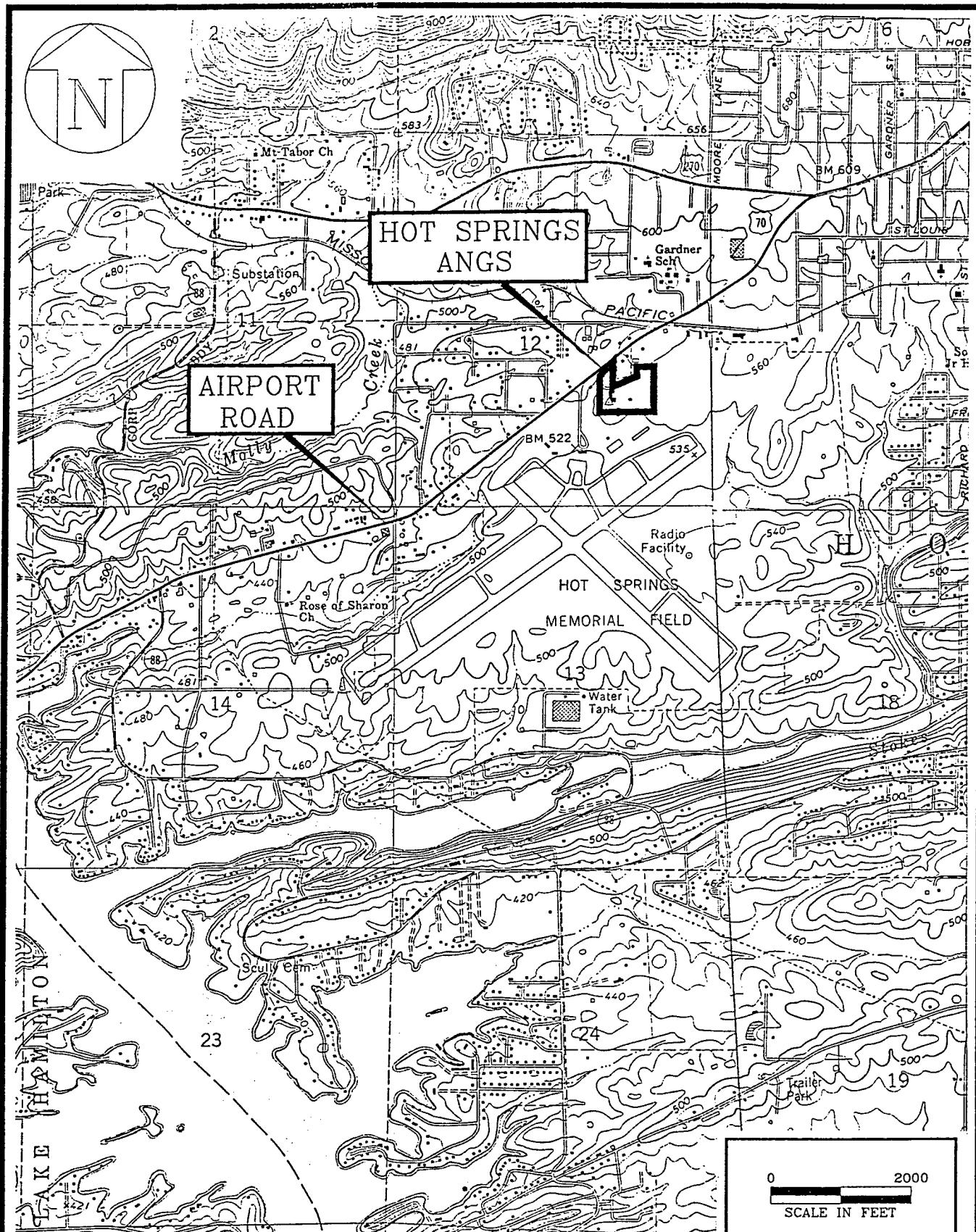
FIGURE 2.1

STATE MAP  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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SOURCE : USGS 7.5 MINUTE TOPOGRAPHIC MAP, HOT SPRINGS SOUTH, ARK, 1976.

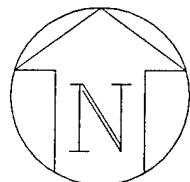
FIGURE 2.2

7.5' TOPOGRAPHIC MAP  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

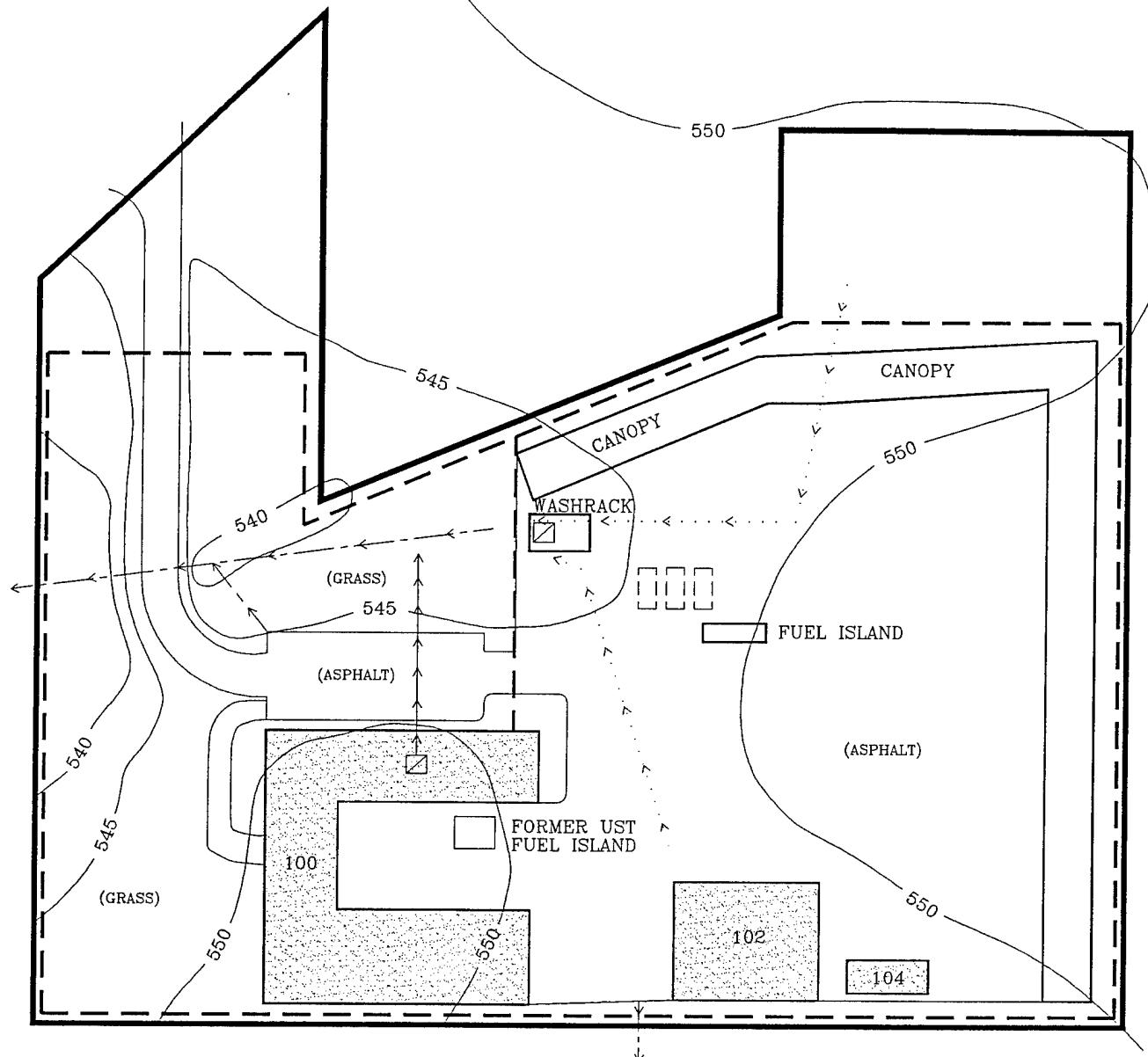
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0 100  
SCALE IN FEET



#### LEGEND

— ANG BOUNDARY	↔↔	STORM SEWER	□□	UST
██████ BUILDING	<...<..	FRENCH DRAIN	□	OIL/WATER SEPARATOR
— FENCE	↔↔	OIL/WATER SEPARATOR DRAIN	✓550/	TOPOGRAPHIC CONTOUR LINES

SOURCE: 223rd CBCS MAP, 1993.

FIGURE 2.3

HOTSPRNG\PRES3-3S

HOT SPRINGS ANGS  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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## **SECTION 3.0 ENVIRONMENTAL SETTING**

Arkansas is located in the south central United States, and borders the Mississippi River on its western bank. The State consists of two primary physiographic regions which divide the State roughly diagonally from northeast to southwest. Low mountains and valleys, including the Ozarks, make up the northwestern region of the State, while flatter lowlands leading toward the Mississippi make up the southeastern region of the State. Hot Springs ANGS is located in Garland County (west central Arkansas) at the southeast edge of the Ouachita Mountains. These mountains, with elevations up to 2,500 feet above mean sea level (MSL), form the southern portion of the hilly and mountainous northwestern region of Arkansas. The elevation at Hot Springs ANGS is approximately 550 feet above MSL, while the nearby surrounding terrain ranges up to 1,400 feet above MSL (see Figure 2.1). Lake Hamilton, on the Ouachita River, is approximately 2.0 miles southwest of the ANG Station.

### **3.1 METEOROLOGY**

The climate in the Hot Springs area is characterized by hot summers and relatively cool winters, with longer pleasant spring and fall seasons. In winter, the daily temperatures range from 31° F to 55° F, while in summer the daily temperatures range from 69° F to 93° F. The average annual precipitation is 55.1 inches, including 4 inches of snow. Rainfall is distributed fairly evenly throughout the year. The average monthly precipitation ranges from 3.31 inches in August to 6.43 inches in May. The heaviest 1-day rainfall of 8.35 inches was recorded on 16 July 1963. Rainfall intensity, based on a 2-year, 24-hour duration, is 4.2 inches. Free water surface evaporation in the Hot Springs area is approximately 36 inches per year, resulting in a net precipitation of 19.1 inches per year. The prevailing wind is from the southwest, and the highest average wind speed of 10 miles per hour is experienced during the springtime.

### **3.2 GEOLOGY**

The geology of the Hot Springs area is dominated by conformal and non-conformal sedimentary rocks, all of Paleozoic age. These sedimentary rocks include Stanley shale and Hot Springs sandstone of Mississippian origin, Arkansas novaculite of Devonian origin, Missouri Mountain shale and Blaylock sandstone of Silurian origin, and Polk Creek shale, Bigfork chert and Womble shale of Ordovician origin (see Figure 3.1). The Stanley shale is a bluish-black to black clayey shale with large beds of sandstone separated by thicker beds of shale; small flakes of mica are common. The Hot Springs sandstone is composed of laminated hard gray quartzitic sandstone, with some shale and conglomerate. The Arkansas novaculite ranges from massive

## GENERALIZED STRATIGRAPHIC COLUMN

SYSTEM	FORMATION	TYPICAL THICKNESS (feet)
MISSISSIPPIAN	STANLEY SHALE	3500
	HOT SPRINGS SANDSTONE	0-200
DEVONIAN	ARKANSAS NOVACULITE	100-800
SILURIAN	MISSOURI MOUNTAIN SHALE	50-100
	BLAYLOCK SANDSTONE	0-550
ORDOVICIAN	POLK CREEK SHALE	25-200
	BIGFORK CHERT	700
	WOMBLE SHALE	250-900

SOURCE: PURDUE AND MISER, 1923; BENDIGER ET AL. 1979.

FIGURE 3.1

GENERALIZED STRATIGRAPHIC COLUMN  
FOR THE HOT SPRINGS AREA

HOTSPRNG\GENSTRAT

223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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C O R P O R A T I O N

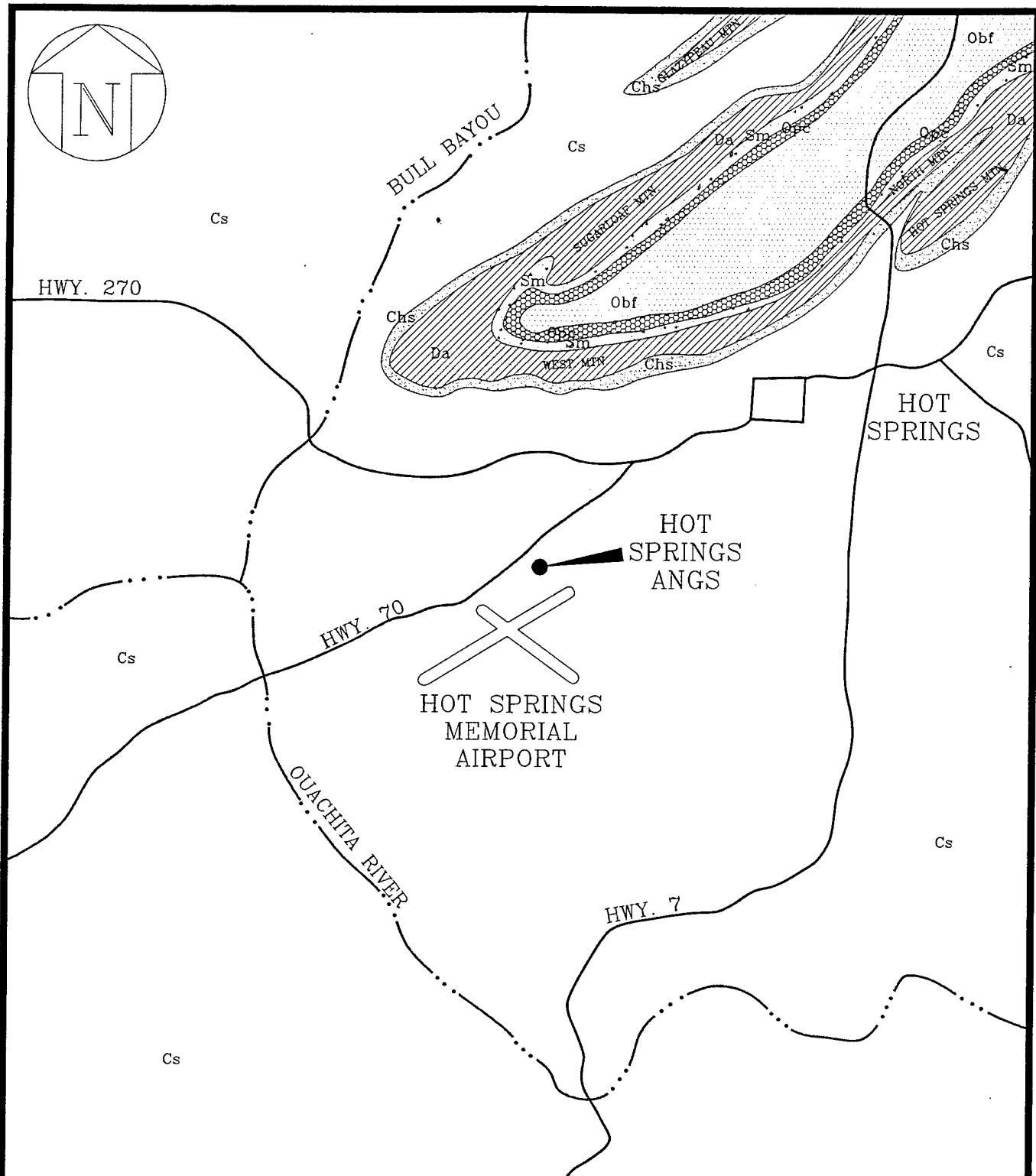
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white novaculite, slightly to highly calcareous, to thin-bedded dark novaculite interbedded with clay and siliceous shale. The Missouri Mountain shale, a clay shale, is commonly dark greenish drab to black but appears red in the Hot Springs area. The Blaylock sandstone is a fine-grained light to dark gray or green compact, hard sandstone. The Polk Creek shale, a black graphitic shale, is in some places siliceous and in others clay shale. The Bigfork chert consists of thin-bedded gray to black chert with a few veins of quartz, much scattered and interbedded with layers of black shale. The Womble shale is a fine- to medium-grained sandy gray limestone, with limy siltstone and slightly limy dark gray shale, with abundant veins of calcite and quartz.

These rocks were subjected to very strong compressive forces during the late Paleozoic age, creating extensive folding and faulting. The novaculite is relatively resistant to erosion; and therefore, is present as the folds which are now exhibited as numerous northeast to southwest-trending ridges in the region. The more erodible shale, sandstone, and chert are present in the accompanying valleys and basins. The uppermost geologic units present in the vicinity of Hot Springs ANGS are depicted in Figure 3.2. Directly underlying Hot Springs ANGS is the Stanley shale, which is estimated to be present at depths up to 3,500 feet below land surface (BLS) in the Hot Springs area. The closest outcropping of Arkansas novaculite is West Mountain, which lies approximately 1.5 miles north of the Station.

### 3.3 SOILS

The soil associated with virtually all of Hot Springs Memorial Airport is udorthents (see Figure 3.3), defined as that which remains from areas that have been excavated and stripped of soil material, and has subsequently been backfilled and shaped for a specific purpose. The udorthents range from a gravelly loam to a very cobbly clay loam. There is no arrangement of soil layers because of the mixing which has occurred during excavation and backfilling. The soil has moderate to rapid permeability and slopes of 1 to 12%. Directly surrounding the airport are two closely related soils, Bismarck-Clebit-Sherless complex (40/30/20% and slopes of 3-8%) and Bismarck-Sherless-Clebit complex (40/30/20% and slopes of 8-12%). The Bismarck-Sherless-Clebit complex lies very close to the northern edge of the Station. The Bismarck soil is a silt loam with permeability in the range of 0.6 to 2.0 inches per hour (in/hr). The Clebit soil is a gravelly loam with permeability in the range of 2.0 to 6.0 in/hr. Finally, the Sherless soil is a fine sandy loam with permeability spanning the range from 0.6 to 6.0 in/hr. In the case of each of these three soils, bedrock is typically encountered at shallow depths, making excavations for buildings, septic tank drain fields, and the like difficult. The typical depth to bedrock for the Bismarck and Clebit soils is only 10-20 inches BLS, while for the Sherless soil, it is 20-40 inches BLS.



SOURCE: PURDUE AND MISER, 1923.

FIGURE 3.2

HOTSPRNG\GEO

GEOLOGIC MAP OF THE  
VICINITY OF HOT SPRINGS ANGS  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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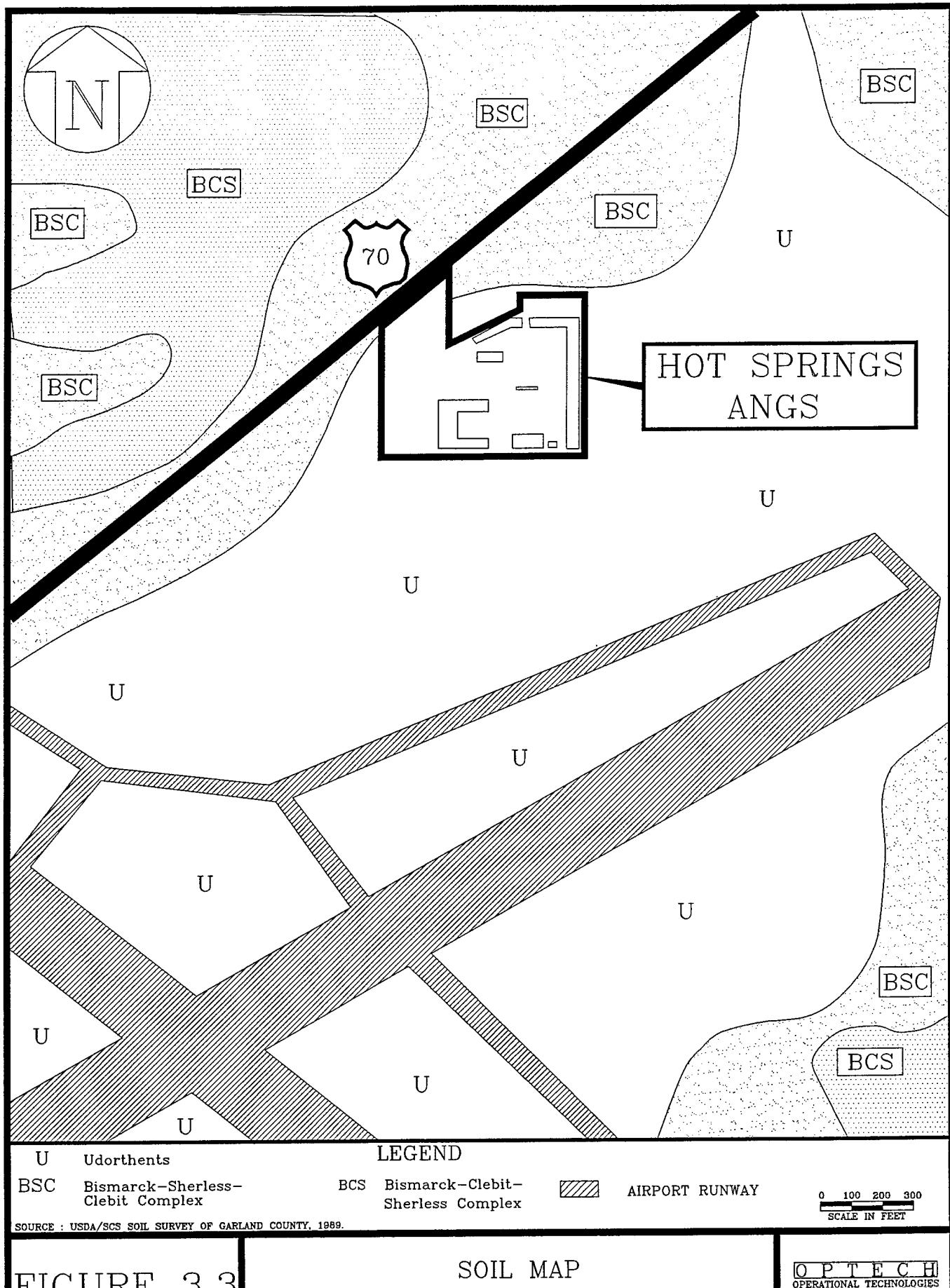


FIGURE 3.3

HOTSPRNG\SOILMAP

SOIL MAP  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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### **3.4 SURFACE WATER HYDROLOGY**

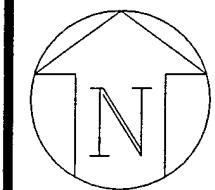
Hot Springs ANGS is located in the Upper Ouachita River Basin. There are three major lakes on the Ouachita River; they include, in downstream order, Lake Ouachita, Lake Hamilton, and Lake Catherine, with Lake Ouachita being the largest. The Ouachita River generally flows southeast through Arkansas and south through Louisiana before joining the Red River near its confluence with the Mississippi. The drainage area of the closest lake, Lake Hamilton, is 1,420 square miles, which includes Lake Ouachita upstream.

The Station is located near the headwaters of Hogan Creek. The area in the vicinity of the Station is drained by Stokes Creek to the east, Molly Creek to the north, and Hogan Creek to the southwest and west. All of these creeks drain within distances of 2.0 miles or less into Lake Hamilton. The storm sewer drainage system at the Station, shown in Figure 3.4, includes both surface runoff and two French drains recently installed under the asphalt. The drains from the two oil/water separators also feed into the storm sewer system. This storm sewer empties into Hogan Creek approximately 0.5 miles from the Station, and then into Lake Hamilton 1.6 miles downstream from the Station (see Figure 3.5).

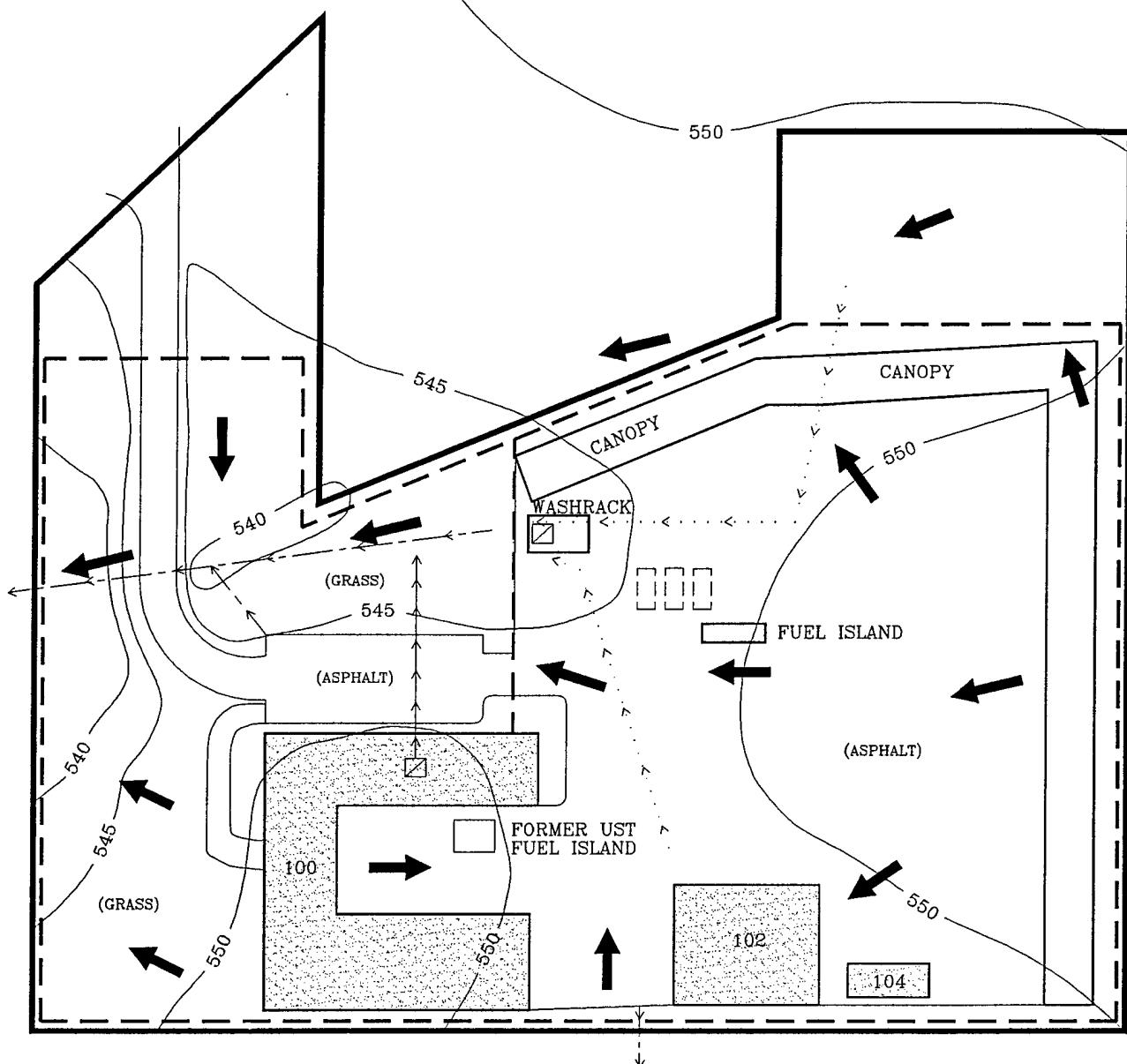
Hot Springs ANGS is connected to the water supply system of the city of Hot Springs. The city obtains its water supply entirely from surface water sources, specifically from the Ouachita River directly below Lake Ouachita and from three small lakes north of the city. The Station's sanitary sewer lines have been connected to the city of Hot Springs sewer system since 1957. Therefore, no septic systems or drain fields were ever installed at the Station.

### **3.5 HYDROGEOLOGY**

In general, few productive aquifers exist in northern and western Arkansas; therefore, public water supplies are usually derived from surface water sources. In contrast, alluvial aquifers are heavily used in eastern Arkansas for agricultural purposes. The exception to this is the numerous hot and cool natural springs which exist in a concentrated area in and around Hot Springs National Park, located virtually in the center of the city of Hot Springs. The famous Hot Springs consist of over 40 springs which produce approximately 800,000 gallons per day of water at approximately 61° C. The localized aquifer which feeds these springs consists of Bigfork chert and Arkansas novaculite formations located approximately 3-5 miles north and northeast of the Station. The very permeable chert (fracture permeability) represents the recharge zone of the aquifer, lying northwest of the springs. The closest portion of this recharge zone is 1.9 miles from the Station. The water which leads to the hot springs infiltrates 4,500



0 100  
SCALE IN FEET



LEGEND		SURFACE RUNOFF
—	ANG BOUNDARY	← → SURFACE RUNOFF
■	BUILDING	↔ ↔ STORM SEWER
- - -	FENCE	↔ ↔ FRENCH DRAIN
↔ ↔		↔ ↔ OIL/WATER SEPARATOR
		↔ ↔ OIL/WATER SEPARATOR DRAIN
		/550/ TOPOGRAPHIC CONTOUR LINES

SOURCE: 223rd CBCS MAP, 1993.

FIGURE 3.4

HOTSPRNG\PRES3-3S

STATION SURFACE DRAINAGE  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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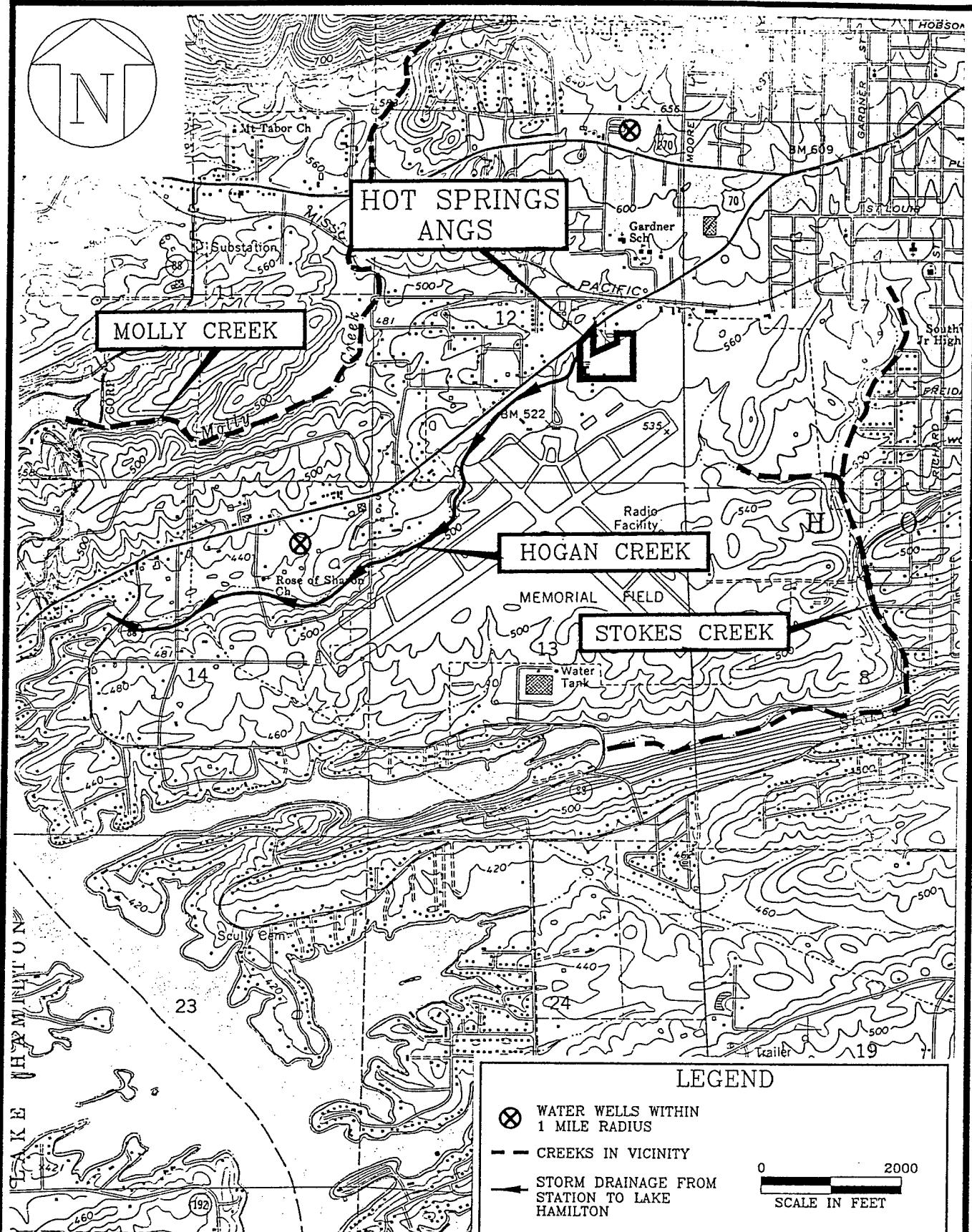


FIGURE 3.5

WATER WELL AND STORMWATER  
DRAINAGE LOCATIONS  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

HOTSPRNG\HOT3-4W

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to 7,500 feet in the chert, is heated and then travels through faults in the novaculite to reach the surface. The age of the hot springs water is estimated to be approximately 4,400 years.

Productive water wells in the Hot Springs area are generally associated with either the Bigfork chert or Arkansas novaculite formations. Of the underlying Paleozoic formations, only the chert has good permeability, while the shale, sandstone, and novaculite in the area have both limited permeability and holding capacity. There are no other sources of groundwater in the area besides these consolidated rock formations. Groundwater storage is limited to fractures and fissures in the consolidated formations. Therefore, water wells generally provide yields suitable only for domestic supply, on the order of 10 gallons per minute or less, at depths of around 100 feet BLS or less. The quality of groundwater is generally good, except for the presence of excessive iron. Commonly, the depth to groundwater is approximately 20 feet BLS, and water wells are installed from three to five times that depth. Seasonal variation in groundwater elevation may fluctuate from 10 to 20 feet BLS.

There are two domestic water wells located within 1 mile of Hot Springs ANGS, as shown in Figure 3.5. Both of these wells were drilled through clay, shale, sandstone, and blue shale materials; bedrock was encountered while drilling between 0 and 10 feet BLS. The static water level in both was encountered at approximately 20 feet BLS; one well was completed to a depth of 100 feet BLS while the other was completed to a depth of 140 feet BLS. The well logs do not provide any information on the installed screening of these two wells.

### **3.6 CRITICAL HABITATS/ENDANGERED OR THREATENED SPECIES/WETLANDS**

There are approximately 93,000 acres of wetlands in the Upper Ouachita Basin (a seven county area in which Garland County is in the northeast portion). Garland County is located in the uplands of this basin, therefore, no wetlands have been identified in the county. The 93,000 acres of wetlands occur primarily in downstream, lowland areas of the Upper Ouachita Basin.

There are a number of endangered or threatened species in the State of Arkansas; a few may live in Garland County. These include the red-cockaded woodpecker, the Indiana bat, the bald eagle, the Arkansas fatmucket mussel, and the Florida panther (also known as cougar). The bald eagle has been known to winter at Lake Ouachita northwest of the Hot Springs area, and there have been confirmed nesting sites in Montgomery County, the county directly west of Garland County. Other than the bald eagle, there are no recorded sightings of endangered or threatened species in the Hot Springs area, nor are there any known critical habitats in the area.

Hot Springs National Park is located approximately 4 miles northeast of the Station. A portion of the eastern boundary of the Ouachita National Forest is approximately 3.5 miles west of the Station.

## **SECTION 4.0 SITE EVALUATION**

### **4.1 ACTIVITY REVIEW**

#### **4.1.1 Preliminary Assessment Interviews**

During the PA at Hot Springs ANGS, interviews were completed with seven Station personnel, including the Station commander. Four personnel have been associated with the Station for 39 years. The major operation of the Station which has involved the generation and disposal of hazardous materials is the maintenance of vehicles. Hazardous materials such as oils, solvents, battery acids, paint thinners, and fuels are the primary materials used and disposed in vehicle maintenance operations. Therefore, interview topics focused primarily on the area of vehicle maintenance operations.

The interview process revealed the following locations at the Station which may be of concern because of historical use of hazardous materials (see Figure 2.2).

- Original washrack located in the northern wing of Building 100, equipped with an oil/water separator which drained to an outfall and into the ditch north of Building 100.
- Present washrack located next to the northwest fence, with an oil/water separator which drains westward into a storm drain which replaced the aforementioned ditch.
- Old drum storage area, located along the western fence at the present washrack.
- Present drum storage area, located near the southern fence between Buildings 100 and 102.
- Former UST and fuel island area, located within the 'U' of Building 100. Two USTs (1,000- and 2,000-gallon) were pulled at this area in 1989.
- Present fuel island and UST area, located in the center of the Station; this area includes three USTs (two 1,000- and one 4,000-gallon).

The PA interview process also revealed the following incidents involving hazardous materials or wastes occurred at various times at the Station:

- Battery acid was neutralized and poured down the drain at the original washrack.
- Oily sludge from the oil/water separators and waste diesel fuel were spread along the northeast and east fence lines for weed control.
- Small spills of fuels or oils occurred periodically during the filling of waste container drums; small seepages also occurred from these drums.
- A line containing hydraulic fluid broke one time in the vehicle maintenance bay in the northern wing of Building 100. Ten to 20 gallons of hydraulic fluid leaked out into a concrete pit; all of it was reportedly recovered.
- Ethyl alcohol and trichloroethene (TCE) were used in very small amounts for electronic parts cleaning; no material was disposed, as all of it evaporated in the cleaning process.

#### **4.1.2 Preliminary Assessment Records Search**

As part of the PA at Hot Springs ANGS, some Station records were obtained. These records provided more detailed or corroborating information about the Station in general, and about some of the potential areas of concern. The following records were obtained:

- As-built drawing of Building 100, showing Station topographic contours as well as original soil boring data. Three soil borings showed post hole digger refusal at 2.0 – 2.5 feet BLS, at which point no water table had been encountered. The as-built drawing also showed the location of the outfall and ditch which received effluent from the Building 100 oil/water separator.
- Aerial photograph of Station (from the mid-1970s) which confirms location of ditch and outfall.
- An Environmental Assessment prepared by the Corps of Engineers relating to the acquisition of 8.07 acres adjacent to the Station.

- Stormwater drainage plans for the vicinity of the Hot Springs Memorial Airport.

#### **4.1.3 Hazardous Materials Inventory**

Since its organization, the Station's waste oils and fuel/solvents have been stored in separate 55-gallon drums. Waste oil was originally picked up by a local oil recycling contractor. In the 1970s, waste oils and solvents were transported to Little Rock Air Force Base (LRAFB) and comingled with their wastes for disposal or recycling by a private contractor. Since the 1980s, both waste oil and fuel/solvents have been transported to the Defense Reutilization and Marketing Office (DRMO) at LRAFB for disposition. The historical disposition of all waste materials is shown in Table 4.1.

### **4.2 DISPOSAL/SPILL AREA OF CONCERN IDENTIFICATION**

Interviews with Station personnel and a Station tour resulted in the identification of four areas potentially contaminated with hazardous materials or hazardous wastes. Each of these areas are characterized in detail below, and these locations are depicted in Figure 4.1.

#### **4.2.1 Old Drum Storage AOC**

##### **4.2.1.1 Background and Operational History**

The Old Drum Storage AOC is located along the fence line immediately west of the current washrack (see Figure 4.1). The area is covered by original asphalt pavement on its eastern portion and by grass on its western portion.

This area was used for storage of waste oil and fuel/solvents before pickup by a waste oil recycler or transport to LRAFB. The area was used for this purpose from the late 1950s to the late 1970s. A 250-gallon stationary tank was also present for the collection and storage of waste materials. There were reportedly minor spills in and around drums as they were filled or emptied. Seepages from drums were also reported. Oil or fuel stains are visible on the asphalt at this location. At the time of the PA site visit, there were no signs of stress on the vegetation growing immediately outside the fence.

##### **4.2.1.2 Review of Existing Sampling Data**

No previous sampling data exists for this AOC.

**Table 4.1**  
**Inventory of Hazardous Materials Used at Hot Springs ANGS**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Possible Waste Materials	Quantities/Disposed Gallons/year	Methods of Treatment, Storage, and Disposal in Chronological Order			
		1960s	1970s	1980s	Present
Engine Oil	500	CIV	55-gal. drum LRAFB/CIV	55-gal. drum DRMO	55-gal. drum DRMO
PD-680	50	UNK	55-gal. drum LRAFB/CIV	55-gal. drum DRMO	CIV
Sulfuric Acid	100	Neutralize Storm Drain	Neutralize Storm Drain	Neutralize Storm Drain	DRMO
JP-4	25	UIP	UIP	UIP	UIP
Ethylene Glycol	100	UNK	55-gal. drum LRAFB/CIV	55-gal. drum DRMO	55-gal. drum DRMO
Hydraulic Oil	50	CIV	55-gal. drum LRAFB/CIV	55-gal. drum DRMO	55-gal. drum DRMO
Transmission Fluid	10	CIV	20-gal. drum LRAFB/CIV	20-gal. drum DRMO	20-gal. drum DRMO
Paint Thinner	20	5-gal. drum Evaporation	5-gal. drum Evaporation	5-gal. drum Evaporation	5-gal. drum Evaporation
Brake Fluid	10	UNK	20-gal. drum LRAFB/CIV	20-gal. drum DRMO	20-gal. drum DRMO
Diesel Fuel	50	UNK	55-gal. drum LRAFB/CIV	55-gal. drum DRMO	55-gal. drum DRMO
Grease (Bearing)	30	CIV	30-gal. drum LRAFB/CIV	30-gal. drum DRMO	30-gal. drum DRMO
Paint	25	1-gal. can UIP	1-gal. can UIP	1-gal. can UIP	1-gal. can UIP
Soil Waste Oil Filters	150	Landfill	Landfill	Landfill	DRMO

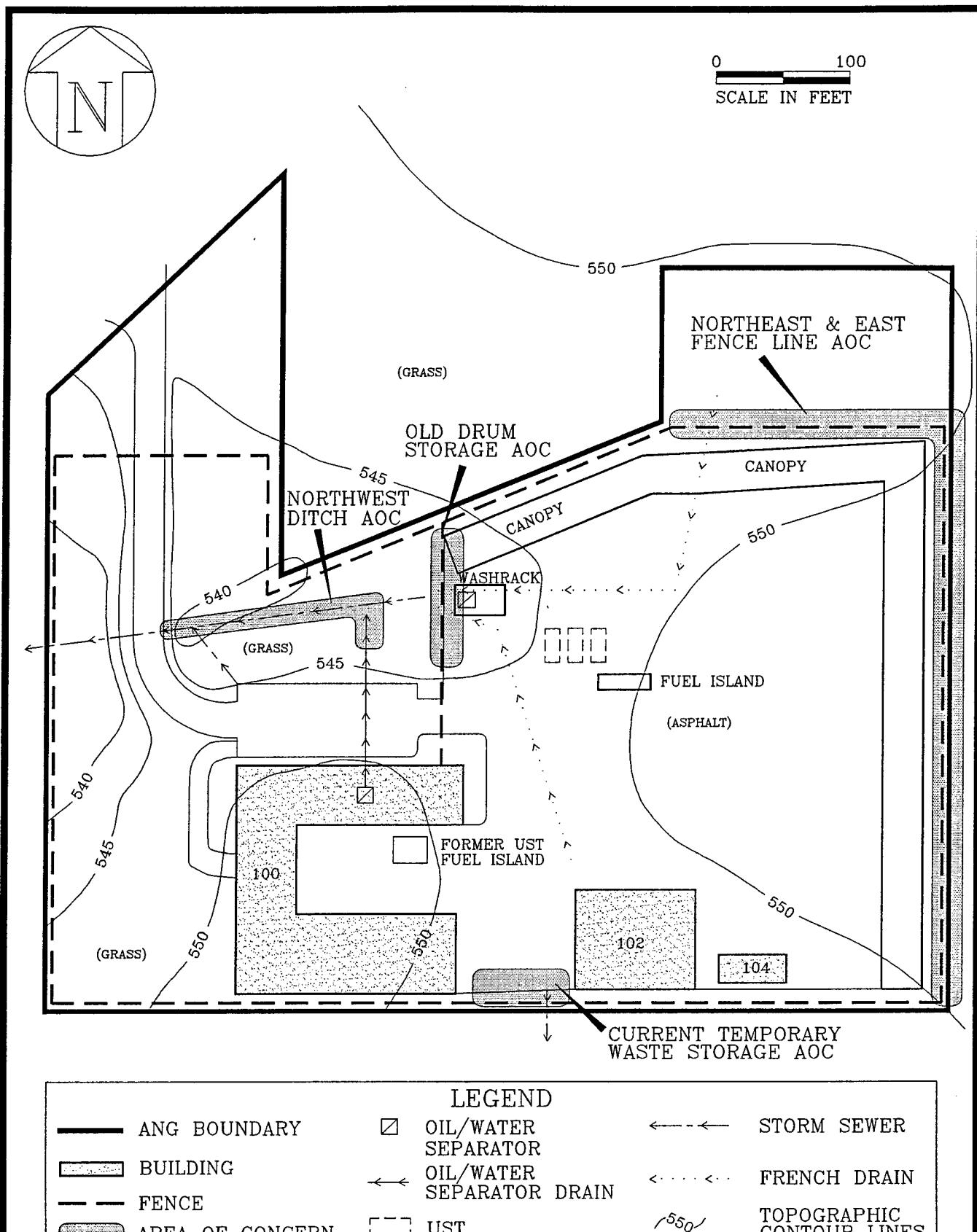
gal. — gallon.

CIV — Civilian Contractor.

UIP — Used in Process.

LRAFB — Little Rock Air Force Base.

DRMO — Directly to the Defense Reutilization and Marketing Office.



SOURCE: 223rd CBCS MAP, 1993.

FIGURE 4.1

STATION AREAS OF CONCERN  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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## **4.2.2 Northeast and East Fence Line AOC**

### **4.2.2.1 Background and Operational History**

The Northeast and East Fence Line AOC is located along the entire eastern fence of the Station and along a portion of the Station's northern fence in the northeast portion of the property (see Figure 4.1). Inside the fence, the area is covered with asphalt for vehicle parking; just outside the fence, natural soil, vegetation (grasses and grapevine), and rock outcrops are present.

Past hazardous waste practices reported in this area involved the spreading of sludge materials from the traps of the Station's two oil/water separators along the fence line for the purpose of controlling undesired vegetation. These traps were cleaned out on an annual basis. Some diesel fuel was also spread along the same fence line for this purpose. These practices occurred from the late 1950s to the early 1980s. For the past 10-15 years, vegetation control has been accomplished solely by the use of a standard herbicide.

### **4.2.2.2 Review of Existing Sampling Data**

No previous sampling data exists for this AOC.

## **4.2.3 Current Temporary Waste Storage AOC**

### **4.2.3.1 Background and Operational History**

The Current Temporary Waste Storage AOC is located on the south edge of the Station, between Buildings 100 and 102 (see Figure 4.1). This area has been used for drummed waste storage since the late 1970s. The drums are set on a concrete pad which is raised slightly above the surrounding asphalt, with a capacity for storage of approximately 9-12 drums.

This area is currently used for storage of waste oil and fuel/solvents in 55-gallon drums before transport to DRMO at LRAFB. There is oil staining present on the concrete pad as well as on the ground adjacent to the pad. There have reportedly been minor spills in and around drums as they were filled or emptied. Also, seepages from drums were reported to have occurred. Vegetation adjacent to the asphalt in this area shows moderate signs of stress. East of this drum storage in a grass-covered area is a stormwater culvert which drains the immediate area. This storm sewer leads out of the Station, heading in a southerly direction, as shown in Figure 4.1.

Just north of the stormwater culvert is an area which, because of staining, is suspected of having been used for equipment washing activities.

#### **4.2.3.2 Review of Existing Sampling Data**

No previous sampling data exists for this AOC.

### **4.2.4 Northwest Ditch AOC**

#### **4.2.4.1 Background and Operational History**

The Northwest Ditch AOC is a former open drainage ditch located north of the privately-owned vehicles (POV) parking area and Building 100 (see Figure 4.1). The ditch was used from 1957 until the mid-1970s. The ditch was replaced by a buried storm sewer in the mid-1970s. The storm sewer is oriented east to west and opens at the eastern edge of a culvert which runs under the main driveway into the Station.

Before the storm sewer was installed, the open drainage ditch received effluent from the Station's original washrack located in the northern wing of Building 100. Standard industrial soap solutions were used in this washrack to clean vehicles. The drain from the washrack went directly to an oil/water separator, whose effluent then went to an outfall at the eastern end of the drainage ditch (See Figure 4.1). Station personnel reported that battery acid (containing lead and sulfuric acid) was disposed of directly into this oil/water separator, after neutralization with sodium bicarbonate. Since it is tied to the washrack, the oil/water separator likely also received solvents, fuels, and oils resulting from vehicle cleaning operations. The construction of the new washrack and installation of the storm sewer occurred in the mid-1970s. Both the old oil/water separator and the new oil/water separator (at the current washrack) are now tied directly to the storm sewer which replaced the open ditch. Stormwater runoff from the Old Drum Storage AOC and the Northeast and East Fence Line AOCs also runs into the current storm sewer.

#### **4.2.4.2 Review of Existing Sampling Data**

No previous sampling data exists for this AOC.

### **4.3 OTHER PERTINENT FINDINGS**

There are two oil/water separators at the Station, as shown in Figure 4.1. The first separator is located in the former washrake and paint booth area, in Building 100. This oil/water separator is still present but is no longer used. The second separator is located at the current washrake. Both oil/water separators discharge their overflow into a storm sewer system, which empties into Hogan Creek approximately 0.5 miles southwest of the Station. The traps of the separators are reportedly cleaned out annually. Arkansas Department of Pollution Control and Ecology (DPC&E) personnel noted, upon reviewing the Final PA/SI Work Plan, that Hot Springs ANGS should have a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of industrial effluent from the oil/water separators into an open stream course, or that the separators should be tied into the sanitary sewer system.

Vehicles at the Station were originally refueled from a storage and fuel island system located between the two wings of Building 100 (see Figure 2.2). This system included one 2,000-gallon and one 1,000-gallon UST, which variously stored diesel and motor vehicle gasoline (MOGAS). This refueling system was removed in 1989, after it was deemed a safety hazard because of its close proximity to Building 100. Station personnel reported that both tanks and the surrounding soil showed no evidence of fuel leakage at the time of excavation, and that the area was certified clean without any need for remediation by the Arkansas DPC&E. The current vehicle fueling system consists of two 1000-gallon USTs and one 4,000-gallon UST, equipped with a leak detection system.

### **4.4 CONCLUSIONS**

The information obtained from the interviews, records search, and the Station site visit identified four potential AOCs at Hot Springs ANGS, namely the Old Drum Storage AOC, the Northeast and East Fence Line AOC, the Current Temporary Waste Storage AOC, and the Northwest Ditch AOC. Each of these areas was identified based on past practices involving use or disposal of hazardous materials which could affect soil, groundwater, or surface water at these locations.

### **4.5 RECOMMENDATIONS**

As a result of the PA activities performed at Hot Springs ANGS, Site Inspection field activities were recommended at the four AOCs identified. The purpose of these activities was to confirm or deny the presence of suspected contamination in soils, sediments, and surface water at these AOCs.

## **SECTION 5.0 FIELD PROGRAM**

The purpose of the SI was to confirm or deny the presence or absence of contamination at the Old Drum Storage, the Northeast and East Fence Line, the Current Temporary Waste Storage, and the Northwest Ditch AOCs identified in the PA at Hot Springs ANGS, and to provide data needed to determine if an AOC requires no further action or should be classified as a site requiring further investigation. This section describes the field activities performed during the Site Inspection to accomplish these objectives, and the methodologies used to conduct these activities. The Site Inspection at Hot Springs ANGS commenced on 23 February 1994 and was completed on 28 February 1994.

### **5.1 GENERAL APPROACH**

The suspected mode of contamination at all four AOCs described in Section 4.2 was by spillage or intentional application to the ground surface, rather than by any pipe or tank leakage processes occurring underground. Therefore, soil borings were the preferred Site Inspection method used to detect the presence of contamination in the soil and to define the near-surface geologic conditions in the study area. Surface water and/or sediment sampling were also employed at two AOCs where surface water flow may provide a contaminant migration pathway.

The Garland County Soil Survey and Hot Springs ANGS Building 100 as-built drawings indicated bedrock may be encountered as shallow as 10-40 inches BLS in the area. Soil borings were therefore planned for different depths at the various AOCs, ranging from 2 to 10 feet BLS (see Section 5.1 of the Work Plan). The field activities confirmed the presence of shallow bedrock at Hot Springs ANGS, with all borings encountering bedrock at between 1 and 5 feet BLS. The borehole logs are included in Appendix B. Hand auger techniques were used for soil borings at the Old Drum Storage, Northeast and East Fence Line, and Northwest Ditch AOCs, while hollow-stem auger (HSA) techniques were used at the Current Temporary Waste Storage AOC.

### **5.2 FIELD SCREENING ACTIVITIES**

Field screening activities, such as a soil vapor survey or installation of piezometers, were not conducted during the SI. Soil screening was performed during the field investigation at Hot Springs ANGS to provide immediate information as to the environment of the boreholes, and to aid in the selection of soil samples to be submitted for laboratory analysis.

During sampling of soil borings, the air around the sampler was monitored with a HNu DL-101 Data Logging PID immediately upon opening the sampler (to maximize the detection of volatiles). The soil samples collected were placed in plastic bags, and the HNu DL-101 PID used to conduct ambient temperature headspace analysis (ATHA) for photoionization compounds. All PID readings are indicated on the boring logs included in Appendix B. Soil samples were also field screened using a Photovac 10s+ Portable GC. The field GC, calibrated to screen for benzene, toluene, ethylbenzene and xylenes (BTEX), was used to detect the presence of these compounds in the headspace from the soil samples collected. Headspace analysis was used to provide immediate information as to the environment of the borehole. Data obtained from the field GC and PID supplements analytical laboratory data. Field GC data is summarized in Subsections 6.3.1, 6.4.1, 6.5.1, and 6.6.1, Field Screening Results. All field GC and PID screening results are presented in Appendix C.

### **5.3 CONFIRMATION ACTIVITIES**

Anderson Engineering Consultants, Inc., of Little Rock, Arkansas, was retained as the drilling contractor for all HSA activities. The selected drilling contractor mobilized personnel and equipment that met or exceeded Arkansas ANG and/or Arkansas DPC&E requirements.

Environmental Services Company, Inc., of Little Rock, Arkansas, was retained to perform laboratory analyses. Provisions were made for proper sample containers, labels, chain-of-custody forms, sample stabilization and preservation, and packing materials by the selected laboratory.

B&F Engineering, Inc., of Hot Springs, Arkansas, was retained as the surveying contractor. The Station boundaries, buildings, parking areas, and soil boring locations at each AOC were surveyed. The land surface elevation of each borehole is shown on the soil boring logs in Appendix B.

An Arkansas Registered Professional Geologist (RPG) from B&F Engineering, Inc., was retained for geologic characterization activities. As required by the Rules of the Arkansas State Board of Registration for Professional Geologists, the Arkansas RPG provided lithologic descriptions of the materials encountered during soil boring activities.

### **5.3.1 Soil Borings**

Soil borings were installed to obtain soil samples for laboratory analysis for confirming the presence or absence of subsurface soil contamination. Soil samples were also used for determining site geology and subsurface soil characteristics.

A total of 16 soil borings were installed for data collection. All work was performed in a manner consistent with DPC&E requirements. All soil boring depths were limited to the depth at which shale bedrock was encountered, which ranged from 1 to 5 feet BLS. Three borings were drilled using HSA methods and 13 were drilled using a hand auger. All soil boring locations and elevations were determined by the surveyor contracted for Hot Springs ANGS field work.

#### **5.3.1.1 Drilling With Hand Auger**

A stainless steel 2-inch inside diameter hand auger was used to perform drilling and sampling of soil borings. The hand auger consisted of a hollow stainless steel drilling bit, extensions for depths to 10 feet, and a handle. A hollow sampling bit which holds brass sleeves was used to retrieve soil samples for field screening and laboratory analyses. The auger was retrieved and the standard bit replaced by the sampling bit when the drilling activity reached depths at which a sample was desired.

Soil samples utilizing a hand auger were collected in a stainless steel auger barrel. Two 5-inch brass sleeves were used to contain the soil samples. Sufficient volume of soil was recovered at each sampling interval to meet analytical testing requirements outlined in the OpTech Corporate Environmental Quality Assurance/Quality Control Plan (CEQP). The actual sample depths submitted for laboratory analysis are discussed in Subsections 6.3.2, 6.4.2, and 6.6.2 and shown on the soil boring logs in Appendix B. The hand auger extensions, drilling, and sampling bits were decontaminated and new brass sleeves inserted before each sampling event.

#### **5.3.1.2 Drilling With Hollow-Stem Auger**

Soil borings were completed by using HSA methods at the Current Temporary Waste Storage AOC, since the drilling depth was originally planned for 10 feet BLS. The HSA drilling method employs a hollow helical steel drill tool that is rotated to advance the boring and lift formation materials (cuttings) to the surface. The flights for the HSA are welded onto steel pipe and a cutter head is attached to the "lead" (bottom) auger to cut the hole. During drilling, a center

bit is inserted into the hollow area of the cutter head that prevents cuttings from re-entering the hollow portion of the auger. Generally, the center bit is flush with or extends no more than 1/2 foot below the cutter head. The center bit connects through the auger flights by small diameter drill rods and is attached to the top-head drive unit of the drill rig. The top-head drive is powered by a truck-mounted engine that mechanically rotates the entire flight of augers. The hollow opening allows the insertion of sampling tools (i.e., split-spoon sampler) with the augers in place to prevent caving of the borehole.

Soil samples were collected below the surface and above the bedrock for subsurface characterization and field screening. An 18-inch carbon steel California-style sampler equipped with three 6-inch brass sleeves was used for collecting soil samples for laboratory analysis. Actual sample depths submitted for laboratory analysis are discussed in Subsection 6.5.2, and shown on the soil boring logs included in Appendix B. The California-style sampler was decontaminated and new brass sleeves inserted before each sampling event.

Auger flights, drill rig(s), and tools were thoroughly steam-cleaned in the designated decontamination area at the washrack before initial use and after the completion of each borehole.

Borehole abandonment activities conformed to applicable State of Arkansas requirements. All hand auger and HSA borings were backfilled with pure bentonite grout after sampling was accomplished to prevent the downward migration of contaminants through the open borehole.

### **5.3.2 Surface Water and Sediment Sampling**

The surface water sample was collected using the laboratory analysis containers. The sampler did not enter the body of water being sampled. The temperature, pH, and specific conductance of the surface water sample were measured on-site at the time of sample retrieval. A sediment sample was collected using a decontaminated stainless steel trowel.

### **5.3.3 Specific Media Sampling**

This subsection summarizes the analytical program followed for soil, sediment, and surface water samples collected during the Site Inspection to determine the presence or absence of contamination at four AOCs.

Past activities at the site indicate that the suspected contamination consists primarily of waste oil, diesel fuel, oil/water separator sludge, solvents, and neutralized battery acid. Therefore, for all matrices sampled, the analytical program of the PA/SI focused on the detection of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), priority pollutant metals, and total petroleum hydrocarbons (TPH).

To comply with DPC&E requirements, and to fulfill the requirements of the PA/SI, soil, sediment, and surface water samples were analyzed for VOCs using Method SW8240; SVOCs using Method SW8270; priority pollutant metals by SW7000 series Methods, and TPH by California Modified Method 8015. Table 5.1 summarizes the analytical program for all 16 soil boring locations, as well as the single sediment, surface water, and surface soil sampling locations.

#### **5.3.3.1 Soil Sample Preservation**

All soil samples submitted for laboratory analysis collected with a hand auger sampler or a California-style split-spoon sampler were contained in brass sleeves. Immediately upon removal from the sampler, the sleeve ends were covered with a teflon barrier, aluminum foil, and fitted with a plastic cap. The plastic caps were then secured with duct tape. The sleeves were properly labeled, placed in plastic bags, stored in coolers, and chilled to 4° C or less. The single sediment sample was contained in an 8-ounce wide-mouth jar having a teflon-lined lid.

#### **5.3.3.2 Surface Water Sample Preservation**

The VOC water sample was stored in a 40-milliliter (mL) volatile organic analysis (VOA) vial with a teflon-lined lid and no airspace. The SVOC and TPH water samples were stored in separate 1-liter amber glass bottles having teflon-lined lids. The total recoverable metal water sample was stored in a 1-liter high density polyethylene bottle with a teflon-lined lid.

The VOC sample was preserved with no more than 2 drops of a 1:1 solution of hydrochloric acid. The total recoverable metal sample was preserved with a solution of 1:1 nitric acid to achieve a pH level of less than 2. SVOC and TPH samples required no preservatives.

**Table 5.1**  
**Laboratory Analyses Summary Table**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

AOC	Matrix	Field Methods	Lab Parameters	U. S. EPA Methods	Investigative Samples
ODS	Soil (Subsurface)	Field Screening using PID, Field GC, Soil Classification	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	5
NEF	Soil (Subsurface)	Field Screening using PID, Field GC, Soil Classification	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	9
CTS	Soil (Subsurface)	Field Screening using PID, Field GC, Soil Classification	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	5
	Soil (Surface)	Field Screening using PID, Field GC, Soil Classification	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	1
NWD	Soil (Subsurface)	Field Screening using PID, Field GC, Soil Classification	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	6
	Soil (Sediment)	Field Screening using PID, Field GC, Soil Classification	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	1
	Water (Surface)	Temperature, pH, Specific Conductance	VOCs SVOCs Metals TPH	SW8240 SW8270 SW7000 series <sup>a</sup> Ca. Mod. 8015 <sup>b</sup>	1

<sup>a</sup>Analytical Methods for specific metals are as follows:

Antimony – SW7041.	Copper – SW7210.	Silver – SW7760.
Arsenic – SW7060.	Lead – SW7420.	Thallium – SW7840.
Beryllium – SW7090.	Mercury – SW7471.	Zinc – SW7950.
Cadmium – SW7130.	Nickel – SW7520.	
Chromium – SW7190.	Selenium – SW7740.	

<sup>b</sup>Extractable (diesel) range only.

ODS – Old Drum Storage AOC.

VOCs – Volatile Organic Compounds.

NEF – Northeast and East Fence Line AOC.

SVOCs – Semivolatile Organic Compounds.

CTS – Current Temporary Waste Storage AOC.

TPH – Total Petroleum Hydrocarbons.

NWD – Northwest Ditch AOC.

PID – Photoionization Detector.

GC – Gas Chromatograph.

Ca. Mod. – California Modified.

## **5.4 AOC-SPECIFIC INSPECTION PROGRAM**

### **5.4.1 Old Drum Storage AOC**

The Old Drum Storage AOC is located on the west side of the current washrack. The AOC is approximately 25 feet wide and 100 feet long and is oriented with its major axis running north-south (see Figure 5.1). The AOC parallels and overlays the asphalt edge west of the washrack. Therefore, the eastern portion of the AOC is covered by asphalt and the western portion is covered by grass. A fence runs through the AOC, parallel to the asphalt edge.

The only underground structures present at this AOC are the oil/water separator which serves the washrack and the storm sewer drain which serves this separator and runs west-southwest.

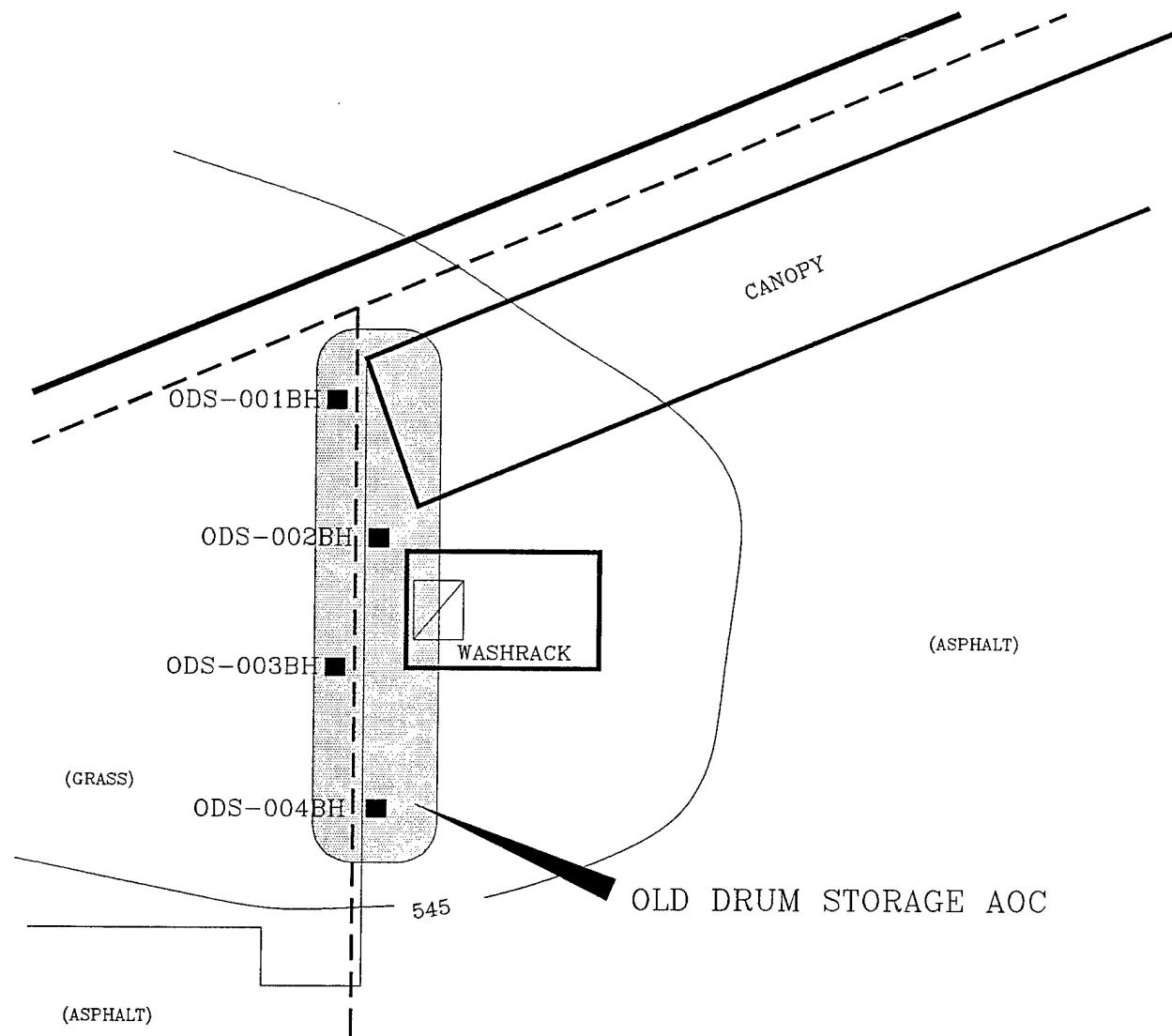
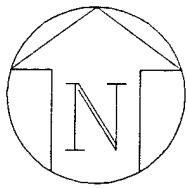
Drums of waste oil and fuel/solvents were previously stored on the asphalt at this AOC, and the suspected contamination is spillage and leakage from these drums onto the surrounding asphalt and ground. Soil borings were used to confirm or deny contamination and to characterize the subsurface geology and soil conditions at this AOC.

#### **5.4.1.1 Soil Borings**

The soil boring locations for the Old Drum Storage AOC are shown on Figure 5.1. Four borings were installed by hand auger methods at the locations originally proposed in the Work Plan. The borings were evenly spaced in the north-south direction. Borings ODS-001BH and ODS-003BH were located on the grass-covered western portion of the AOC to determine if contamination is present due to surface runoff from the asphalted area where the drums were stored. Borings ODS-002BH and ODS-004BH were located on the asphalt where drums were stored, to determine if contamination is present in the soil beneath the asphalt due to infiltration through cracks in the asphalt.

### **5.4.2 Northeast and East Fence Line AOC**

The Northeast and East Fence Line AOC is located along the Station fence line on the east and northeast sides of the property. The AOC is approximately 20 feet wide (see Figure 5.2). It extends in a north-south direction for approximately 400 feet along the eastern Station fence line, and then extends east-west for approximately 200 feet along the northeastern Station fence line. Inside the fence, the AOC is covered with asphalt for vehicle parking and just outside the fence, natural soil, vegetation (grasses and grapevine), and rock outcrops are present. There are no



#### LEGEND

—	ANG BOUNDARY	■	SOIL BORING
□	BUILDING	□	OIL/WATER SEPARATOR
- - -	FENCE		TOPOGRAPHIC CONTOUR LINES
▨	AREA OF CONCERN	1545	0 50 SCALE IN FEET

SOURCE: 223rd CBCS MAP, 1993

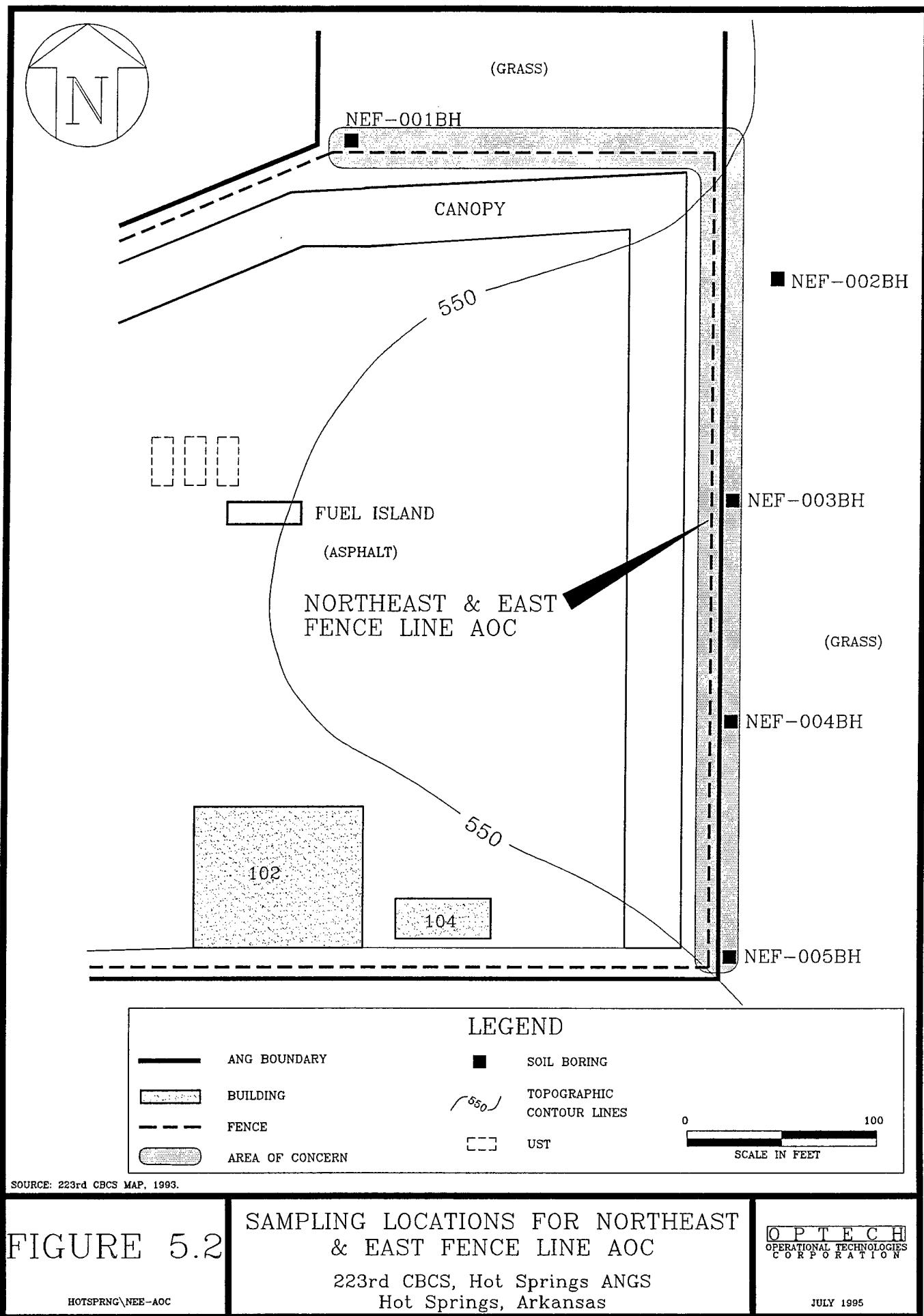
FIGURE 5.1

HOTSPRNG\DRUM-AOC

SAMPLING LOCATIONS FOR  
OLD DRUM STORAGE AOC  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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underground structures present at this AOC. Oil/water separator sludge and diesel fuel were spread on the ground along this fence line for weed control. Soil borings were used to confirm or deny contamination and to characterize the subsurface geology and soil conditions at this AOC.

#### **5.4.2.1 Soil Borings**

The soil boring locations for the Northeast and East Fence Line AOC are shown on Figure 5.2. Five borings were installed by hand auger methods as originally proposed in the Work Plan. Borings NEF-001BH and NEF-005BH were located as originally proposed in the Work Plan. Borings NEF-004BH and NEF-003BH were located 15 and 30 feet south, respectively, of their proposed locations, so as to avoid areas where bedrock outcropped at the surface. Boring NEF-002BH was relocated 60 feet south-southeast of its original location for the same purpose.

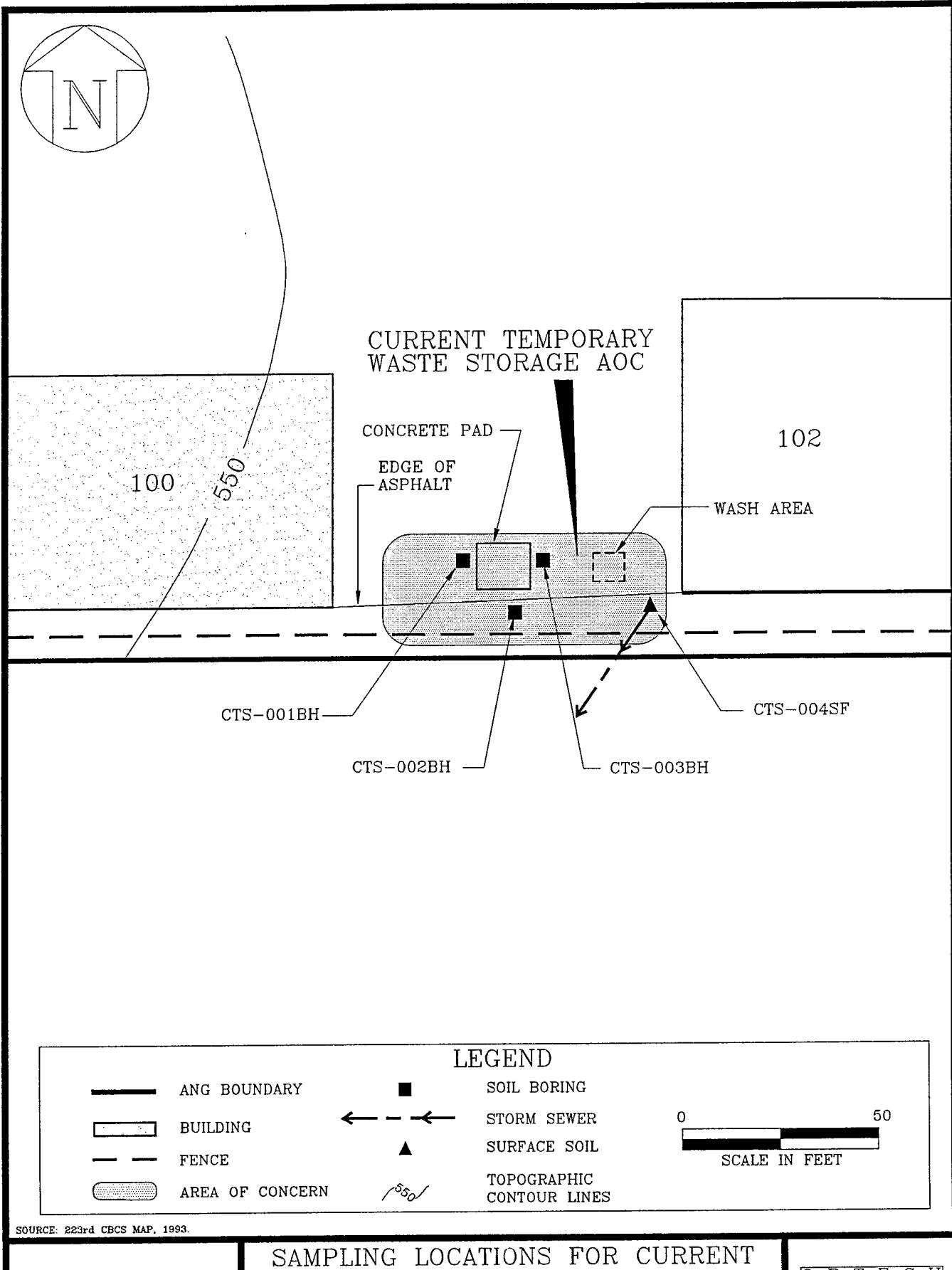
All borings were placed in close proximity to the fence line to determine if contamination was present due to the past practice of spreading oil/water separator sludge and diesel fuel along the fence line for weed control.

#### **5.4.3 Current Temporary Waste Storage AOC**

The Current Temporary Waste Storage AOC is located in the south central portion of the Station between Buildings 100 and 102 (see Figure 5.3). The AOC is approximately 25 feet wide and 75 feet long and is oriented with its major axis running east-west. The AOC covers the concrete pad midway between Buildings 100 and 102, where waste drums are currently stored. The northern portion of the AOC is covered with asphalt and the southern portion is covered with grass. The eastern portion of the AOC also covers an equipment wash area which drains over the surface, to a storm sewer which runs out the southern boundary of the Station.

An underground natural gas line runs east-west parallel to the asphalt edge at this AOC. The location of the line was provided by Station personnel, and did not affect the planned placement of boreholes at this AOC.

Waste oil and fuel/solvent drums are stored on the concrete pad at this AOC. The suspected contamination is from spillage and leakage from these drums onto the surrounding concrete, asphalt, and ground. Soil borings and a surface soil sample were used to confirm or deny contamination and to characterize the subsurface geology and soil conditions at this AOC.



SOURCE: 223rd CBCS MAP, 1993.

**FIGURE 5.3**

HOTSPRNG\TEMP-AOC

**SAMPLING LOCATIONS FOR CURRENT TEMPORARY WASTE STORAGE AOC**

223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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#### **5.4.3.1 Soil Borings**

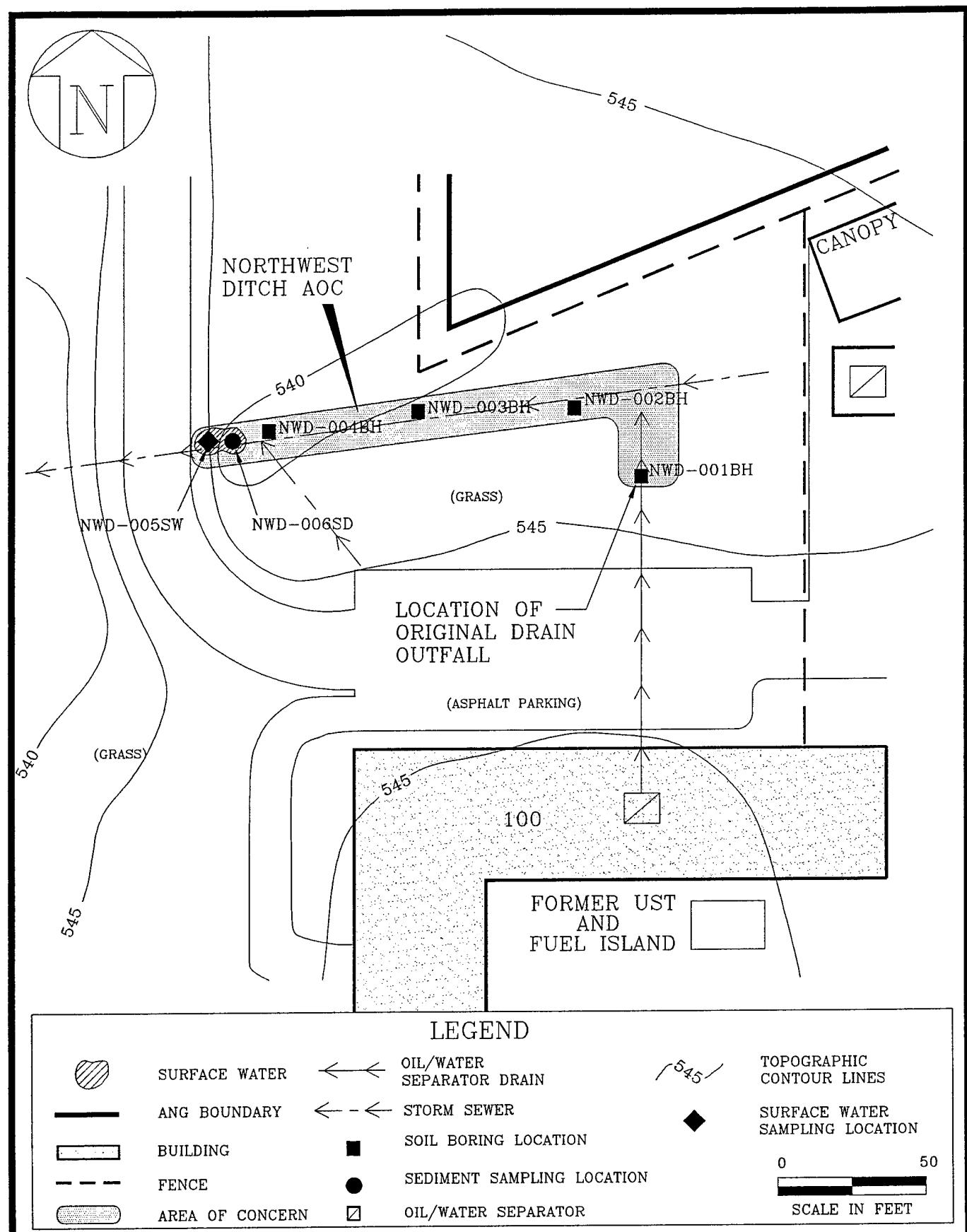
The soil boring locations for the Current Temporary Waste Storage AOC are shown on Figure 5.3. Three borings were installed by HSA method at the locations originally proposed in the Work Plan. Borings CTS-001BH through CTS-003BH were located on the west, east, and south perimeters of the current drum storage pad. Boring CTS-001BH was located immediately west of the pad on asphalt, boring CTS-003BH was located immediately east of the pad on concrete, and boring CTS-002BH was located immediately south of the pad on grass. The purpose of each of these locations was to determine if contamination is present in the soil surrounding the pad due to surface water runoff from the pad and infiltration into the adjacent soils.

#### **5.4.3.2 Surface Soil Sampling**

The surface water drainage pattern across the Current Temporary Waste Storage AOC is generally to the south. One surface soil sample was obtained from the non-paved area near the entrance to the culvert in the southeast corner of the Current Temporary Waste Storage AOC (see Figure 5.3). Surface water from the suspected wash area drains directly to this culvert. Therefore, the location of the surface soil sample was chosen to determine whether contamination is present as the result of surface water infiltration into the soil before entering the culvert.

#### **5.4.4 Northwest Ditch AOC**

The Northwest Ditch AOC is located north of the POV parking area and Building 100 (see Figure 5.4). Before being replaced by the current storm sewer, the ditch received effluent from the old washrack in Building 100. The AOC is approximately 15 feet wide, 150 feet long, and runs east-west, with a slight southerly orientation to the west. The AOC makes a small southerly turn at its east end so as to also include the outfall location for the drain line coming from the Building 100 oil/water separator. At the western end of the AOC, water from the storm sewer briefly daylights into a small pool before continuing westward flow into the culvert which runs under the main driveway into the Station. The entire AOC is covered with grass. The only underground structure present at this AOC is the storm sewer which runs from the current washrack westward to the culvert described above.



SOURCE: 223rd CBCS Map, 1993.

FIGURE 5.4

HOTSPRNG\NW-AOC

SAMPLING LOCATIONS FOR  
NORTHWEST DITCH AOC  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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The suspected contamination is from the effluent from the old Building 100 washrack and its oil/water separator. Soil borings, surface water and sediment sampling were used to confirm or deny contamination and to characterize the subsurface geology and soil conditions at this AOC.

#### **5.4.4.1 Soil Borings**

The soil boring locations for the Northwest Ditch AOC are shown on Figure 5.4. Four borings were installed by hand auger methods at the locations originally proposed in the Work Plan. Boring NWD-001BH was located at the former drain outfall to determine if contamination was present where effluent from the Building 100 oil/water separator daylighted. Borings NWD-002BH through NWD-004BH were evenly spaced east to west along the course of the former ditch to determine if contamination was transported by subsequent effluent flow from the outfall.

#### **5.4.4.2 Surface Water and Sediment Sampling**

The surface water drainage pattern across the Northwest Ditch AOC is generally to the west. As shown in Figure 5.4, one sediment sample and one surface water sample were taken at the location where drainage water exits from the storm sewer, temporarily pools in a small area, and then enters the culvert under the Station entrance road, at the west end of the Northwest Ditch AOC. The purpose of this surface water and sediment sampling station was to determine if surface water continues to serve as a contaminant migration pathway and to determine if contaminants may be adsorbed to sediments in this pathway.

### **5.5 SITE INSPECTION DERIVED WASTE**

During the SI, waste material (drill cuttings and decontamination water) were produced as a result of investigation activities. Soil cuttings from drilling locations and all decontamination water were drummed in steel, plastic-lined 55-gallon Department of Transportation (DOT) drums. A total of three drums were produced; two containing soil cuttings and one containing decontamination water. There were no miscellaneous derived wastes (personal protective equipment (PPE) and visqueen sheeting) which came in contact with soils having PID readings in excess of 100 parts per million (ppm), therefore, all PPE was discarded in a general refuse container at the conclusion of field work. All drums were properly marked to indicate their contents, including the collection date, contractor's name and phone number, and borehole ID number or decontamination water.

Guidance for final disposition of drummed materials is provided in the following subsections. Detailed information on the highest concentrations of analytes in drummed soil cuttings is given in Appendix D. This information, along with suggested letters requesting permission for on-site disposal of soil cuttings and decontamination water from the Arkansas DPC&E and the City of Hot Springs Water and Sewer System have been sent to the Environmental Coordinator for Hot Springs ANGS.

### 5.5.1 Drums Containing Soil

A total of two drums containing soil cuttings were produced during the SI. Numerous boreholes did not produce any soil cuttings due to their shallow depth and the use of the hand auger for drilling and sampling. Table 5.2 lists the drilling locations for which drums have been marked "Soil," the recommended disposition of those drums, and the rationale for each recommendation.

**Table 5.2**  
**Recommended Disposition of Inspection Derived Waste**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Drum Material	Origin	Recommended Disposition	Rationale
Soil	NWD-002BH NWD-003BH NWD-004BH ODS-002BH ODS-004BH	Obtain approval from Arkansas DPC&E for disposal of soil on-site.	Soil sample analyses did not detect contamination exceeding State or Federal action levels.
Soil	CTS-001BH CTS-002BH CTS-003BH	Obtain approval from Arkansas DPC&E for disposal of soil on-site.	Soil sample analyses did not detect contamination exceeding State or Federal action levels.
Water	Decontamination Wastewater	Obtain approval from the City of Hot Springs Water and Sewer System for disposal in sanitary sewer at Hot Springs ANGS.	Analytes washed from sampling equipment are significantly diluted by the volume of the decontamination water.

NWD – Northwest Ditch Area of Concern (AOC).

ANGS – Air National Guard Station.

DPC&E – Department of Pollution Control & Ecology.

CTS – Current Temporary Waste Storage AOC.

ODS – Old Drum Storage AOC.

BH – Borehole.

### 5.5.2 Drums Containing Non-Potable Water

Decontamination water was drummed separately. Table 5.2 includes the one drum marked "Decontamination Water," the recommended disposition of the drum, and the rationale for this recommendation.

## 5.6 DEVIATIONS FROM THE WORK PLAN

There were deviations from the Work Plan. However, in no way did any of the changed procedures or protocols prevent accomplishing the overall objectives of this Site Inspection which were: to confirm or deny the presence or absence of contamination; and to reach a decision point for each AOC.

The deviations from the Work Plan and the rationale for the changes are described as follows:

- The drilling program, as outlined in Sections 5.3 to 5.6 of the Work Plan, was modified as required by specific conditions at the site. Specifically, soil sampling locations were adjusted to avoid bedrock outcroppings and insure the collection of a suitable amount of subsurface soil for laboratory analysis. The modified borehole locations still accomplished the sampling of subsurface soils in an area of concern regarding past waste handling or disposal practices.
- The collection of two subsurface soil samples per borehole, as outlined in Section 7.1 of the Work Plan, was modified because of shallow bedrock (1.0 - 2.0 feet BLS) encountered at seven boreholes (ODS-002BH, ODS-003BH, ODS-004BH, NEF-004BH, CTS-001BH, NWD-001BH, and NWD-004BH). At each of these borehole locations, one sample, representing both the near surface and directly above bedrock horizons, was collected and submitted for laboratory analysis.
- Laboratory analysis for all priority pollutant metals was conducted using SW7000 series Methods (atomic absorption), whereas six of the metals (antimony, beryllium, copper, nickel, silver, and zinc) were designated for analysis by SW6010 (inductively-coupled plasma (ICP)) in Table 7.1 of the Work Plan. The detection limits achieved by atomic absorption are equal to or lower than those achieved by ICP.
- The surface water and sediment samples collected at the Northwest Ditch AOC were not field GC screened for BTEX after collection.

## **SECTION 6.0 SITE INSPECTION RESULTS**

### **6.1 STATION SUBSURFACE GEOLOGY**

Soil samples collected from soil borings were used to provide information to describe the subsurface geology and soil conditions at the Station. All of the AOCs are in close proximity to one another and there is no apparent variation in land surface type between the different AOCs (e.g., there are bedrock outcrops at widespread locations at the Station). The Garland County Soil Survey indicates that only one soil type, udorthents (backfilled material), is present at the Station. Complete lithologic logs for the soil borings installed during this investigation are presented in Appendix B.

The soils encountered at the four AOCs at Hot Springs ANGS are primarily sandy or silty clay, with a frequently included pebbly matrix of sandstone, shale and chert fragments. As shown in Table 6.1, the depth to bedrock at all AOCs was shallow, ranging from 0.8 feet to 5.2 feet BLS. Shallow bedrock depth was present at all AOCs, while the deepest borings were located in the northwest portion of the Station at the Old Drum Storage and Northwest Ditch AOCs. Cross-sections depicting the subsurface geology are indexed in Figure 6.1 and shown in Figures 6.2, 6.3 and 6.4 (refer to Figure B.1, Key to Boring Logs, in Appendix B for identification of the geologic materials presented in these cross-sections).

### **6.2 LABORATORY QUALITY ASSURANCE RESULTS FOR CONFIRMATION SAMPLES**

VOC surrogate recoveries ranged from 76% to 103% for bromofluorobenzene, from 85% to 121% for toluene-d<sub>8</sub>, and from 99% to 129% for 1,2-dichloroethane-d<sub>4</sub>. The recoveries were all within quality control limits for the bromofluorobenzene and toluene-d<sub>8</sub> surrogates, while the recovery for 1,2-dichloroethane-d<sub>4</sub> was slightly higher than the control limits (70% to 121%) in 8 out of 28 samples.

SVOC surrogate recoveries for acid compounds ranged from 44% to 132% for 2-fluorophenol, from 42% to 151% for phenol-d<sub>5</sub>, and from 10% to 110% for 2,4,6-tribromophenol. SVOC surrogate recoveries for base-neutral compounds ranged from 42% to 162% for nitrobenzene-d<sub>5</sub>, from 36% to 82% for 2-fluorobiphenyl, and from 93% to 182% for p-terphenyl-d<sub>14</sub>. The quality control acceptance criteria for SVOC surrogate compounds allows for one acid and/or base-neutral compound to be outside of the specific recovery limits. This criteria was met on 27 of the 28 samples analyzed.

**Table 6.1**  
**Soil Boring Depth Summary**  
**223rd CBCS, Hot Springs, ANGS, Hot Springs, Arkansas**

AOC	Borehole Identification Number	Work Plan Proposed Drill Depth (Ft BLS)	Actual Drill Depth (Ft BLS)
ODS	ODS-001BH	5	5.1
	ODS-002BH	5	1.8
	ODS-003BH	5	0.8
	ODS-004BH	5	1.0
NEF	NEF-001BH	2	2.75
	NEF-002BH	2	3.0
	NEF-003BH	2	3.0
	NEF-004BH	2	0.8
	NEF-005BH	2	2.0
CTS	CTS-001BH	10	1.75
	CTS-002BH	10	2.75
	CTS-003BH	10	3.0
NWD	NWD-001BH	5	0.8
	NWD-002BH	5	4.2
	NWD-003BH	5	5.2
	NWD-004BH	5	1.0

Ft BLS – Feet Below Land Surface.

AOC – Area of Concern.

ODS – Old Drum Storage AOC.

NEF – Northeast and East Fence Line AOC.

CTS – Current Temporary Waste Storage AOC.

NWD – Northwest Ditch AOC.

BH – Borehole.

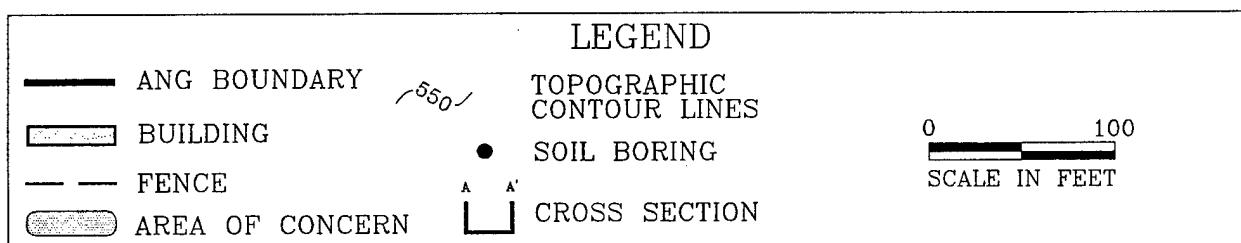
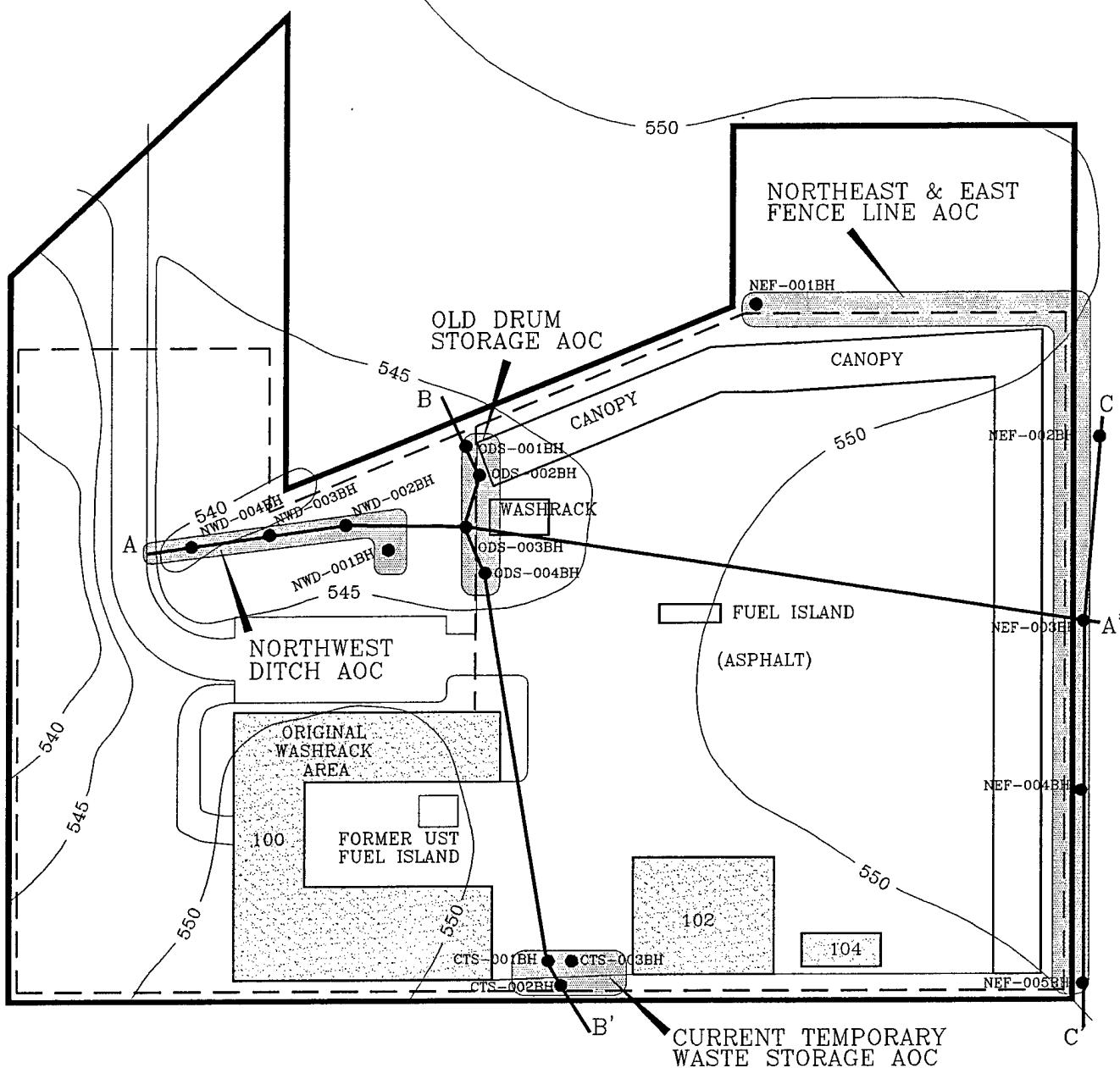
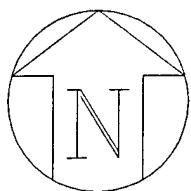
The 28 TPH samples were analyzed in three batches. The matrix spike and matrix spike duplicate recoveries were 87% and 96%, respectively, for the first batch, 95% and 80%, respectively, for the second batch, and 63% and 85%, respectively, for the third batch.

### 6.3 OLD DRUM STORAGE AOC FINDINGS

A detailed description of the AOC, including the locations of soil borings, was given in Subsection 5.4.1.

#### 6.3.1 Field Screening Results

Five subsurface soil samples were field screened with the Photovac 10S+ Portable GC as described in Section 5.2. The GC was calibrated to screen for BTEX. Table 6.2 summarizes the maximum concentrations of BTEX components detected in soil samples collected at the Old Drum Storage AOC. Complete field GC data is presented in Appendix C.



SOURCE: 223rd CBCS MAP, 1993.

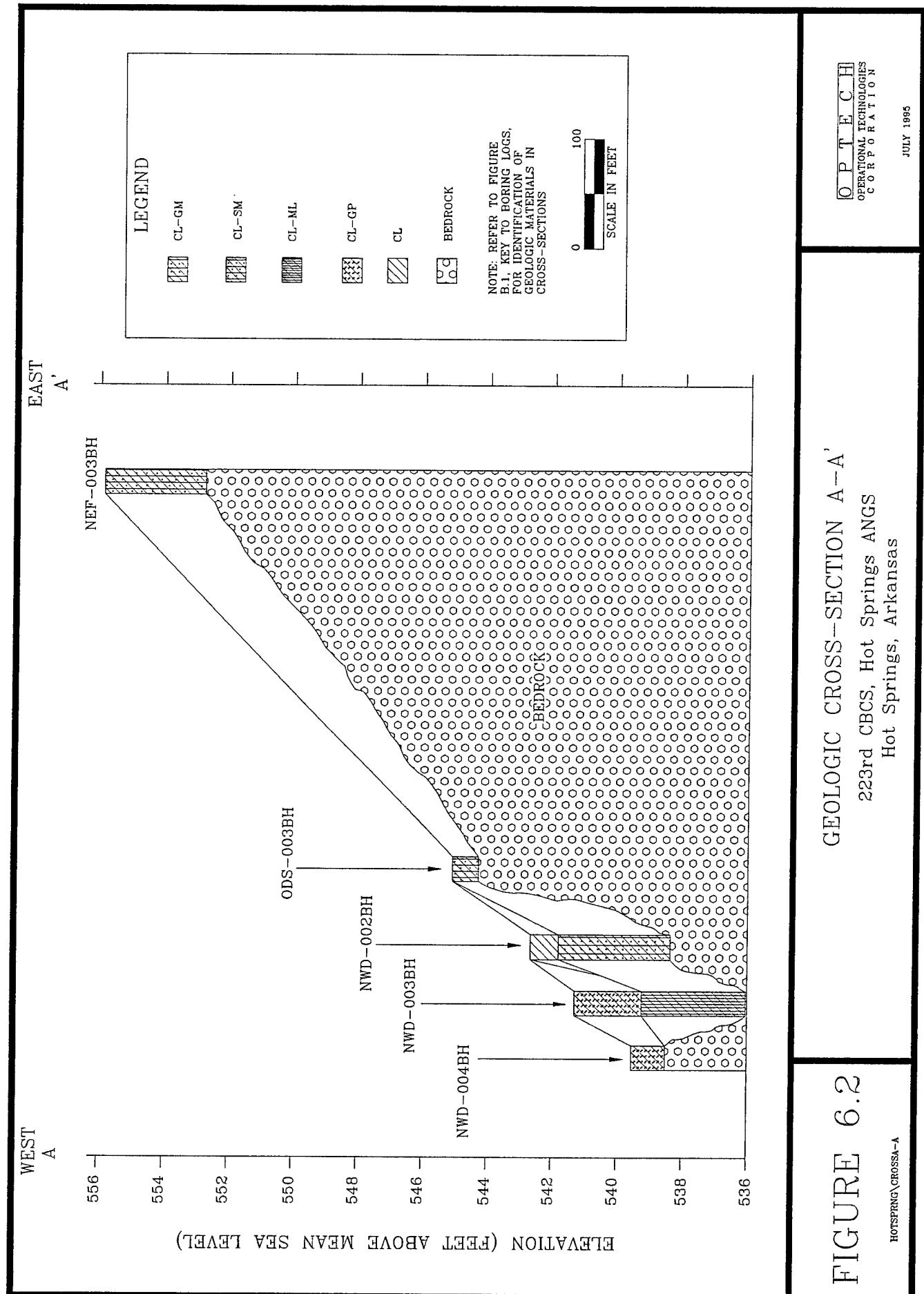
FIGURE 6.1

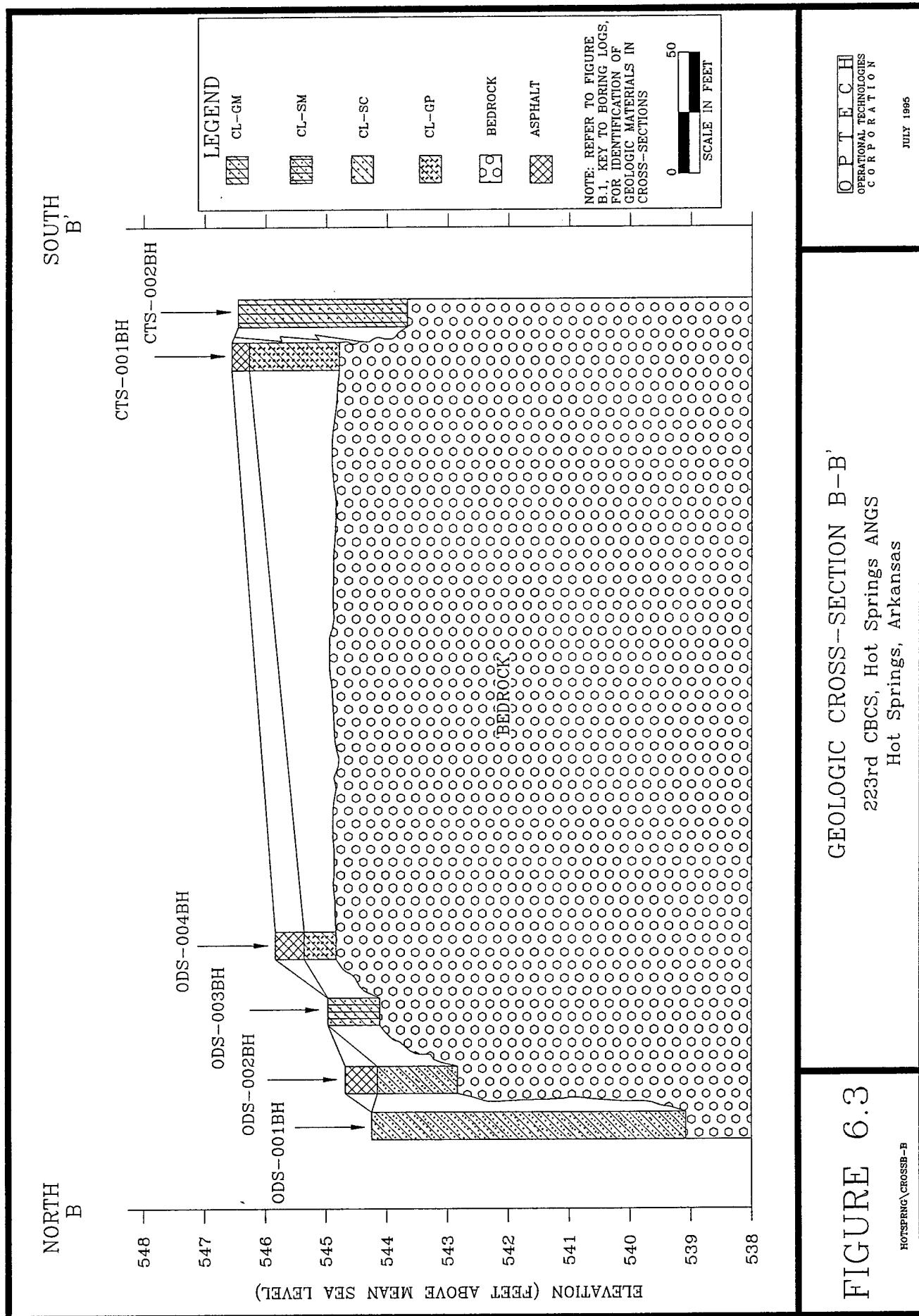
GEOLOGIC CROSS-SECTION  
LOCATION MAP  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

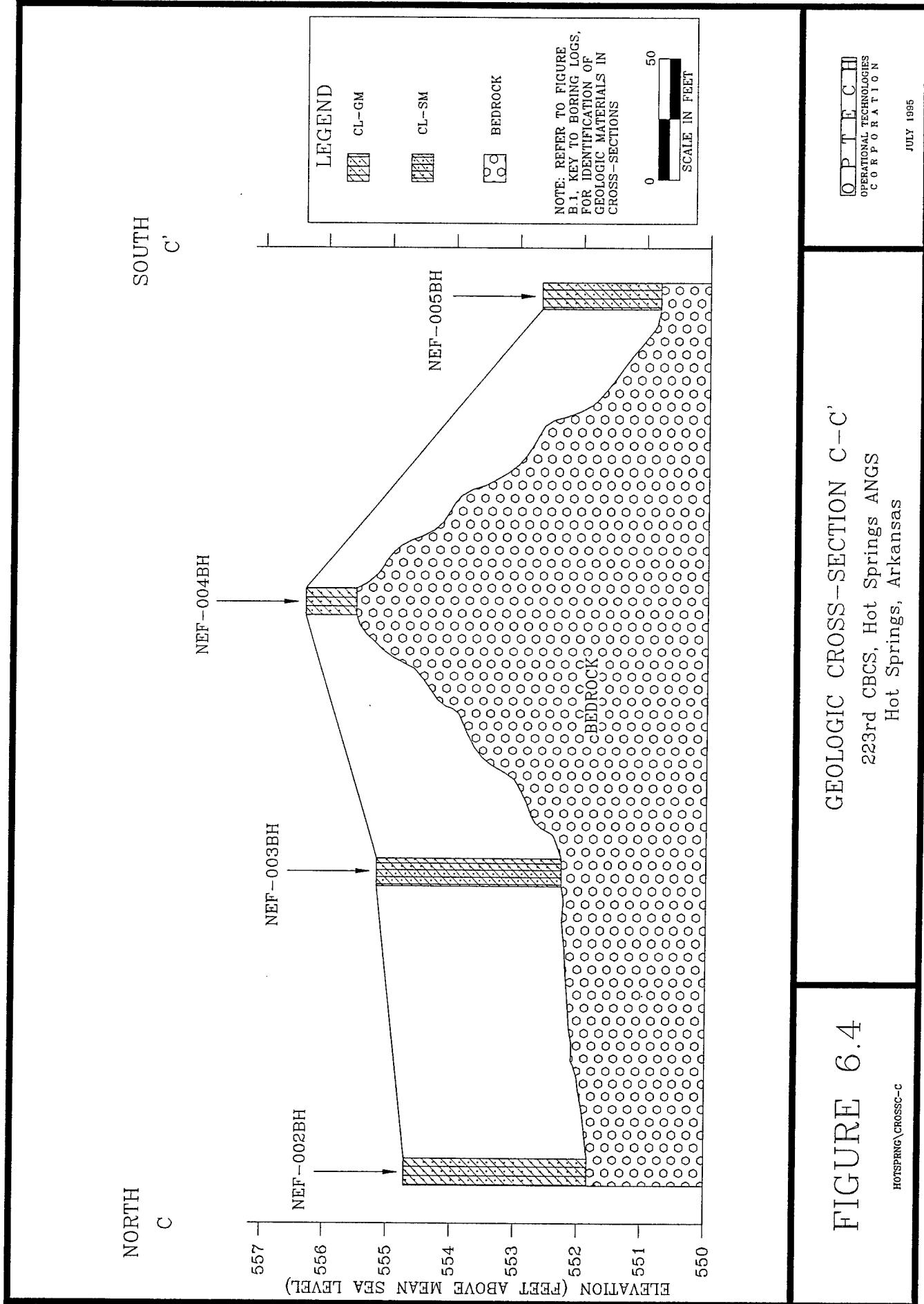
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**Table 6.2**  
**Maximum Field GC Concentrations Detected in Soil Samples**  
**Collected at the Old Drum Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Compound	Maximum Concentration Detected in Soil Samples (ppb)
Benzene	27.7
Ethylbenzene	22.4

ppb – parts per billion.  
 GC – Gas Chromatograph.

AOC – Area of Concern.

Benzene and ethylbenzene were detected in soil sampled from borings ODS-002BH at a depth of 1.0 - 1.8 feet BLS and ODS-004BH at a depth of 0.0 - 1.0 feet BLS. Total BTEX was detected at concentrations of 20.7 parts per billion (ppb) and 50.3 ppb in soil sampled from ODS-004BH and ODS-002BH, respectively. Benzene was detected at a concentration of 27.7 ppb in the sample collected from boring ODS-002BH. Ethylbenzene was detected at concentrations of 20.7 ppb and 22.4 ppb in borings ODS-004BH and ODS-002BH, respectively.

### **6.3.2 Nature of Soil Contamination**

Four soil borings were installed at the Old Drum Storage AOC, from which five investigative samples were collected for laboratory analysis. The borings were installed and samples collected on 25 February 1994. Sampling intervals submitted for laboratory analysis and the analytical program are presented in Table 6.3. A complete listing of laboratory results for all analyses at this AOC is given in Appendix E.

#### **6.3.2.1 VOC Contamination**

VOCs detected in soil samples collected at the Old Drum Storage AOC are shown in Table 6.4. The VOC methylene chloride was detected in all five soil samples collected at concentrations ranging from 16.04 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) to 17.80  $\mu\text{g}/\text{kg}$ , with the highest concentration detected in sample ODS-002BH (1.0 - 1.8 feet BLS). Methylene chloride is a common laboratory solvent and concentrations detected in soil may reflect laboratory induced contamination.

**Table 6.3**  
**Soil Sampling and Analytical Program for Old Drum Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Ft BLS)	Soil Analyses and Methods			
		VOCs (SW8240)	SVOCs (SW8270)	Metals (SW7000 series <sup>a</sup> )	TPH (Ca. Mod. 8015)
ODS-001BH	0.0 - 1.0	X	X	X	X
ODS-001BH	4.0 - 5.0	X	X	X	X
ODS-002BH	1.0 - 1.8	X	X	X	X
ODS-003BH	0.0 - 0.8	X	X	X	X
ODS-004BH	0.0 - 1.0	X	X	X	X

AOC — Area of Concern.

Ft BLS — Feet Below Land Surface.

VOCs — Volatile Organic Compounds.

SVOCs — Semivolatile Organic Compounds.

<sup>a</sup>Metals analyzed by SW7000 series methods as follows:

Antimony — SW7041.

Arsenic — SW7060.

Beryllium — SW7090.

Cadmium — SW7130.

Chromium — SW7190.

Copper — SW7210.

Lead — SW7420.

Mercury — SW7471.

Nickel — SW7520.

Selenium — SW7740.

Silver — SW7760.

Thallium — SW7840.

Zinc — SW7950.

**Table 6.4**  
**Volatile Organic Compounds Detected in Soil Samples**  
**Collected at the Old Drum Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Ft BLS)	Volatile Organic Compounds (µg/kg)	
		Methylene Chloride	
ODS-001BH	0.0 - 1.0		16.04
ODS-001BH	4.0 - 5.0		17.56
ODS-002BH	1.0 - 1.8		17.80
ODS-003BH	0.0 - 0.8		17.09
ODS-004BH	0.0 - 1.0		17.53

µg/kg — micrograms per kilogram.

AOC — Area of Concern.

Ft BLS — Feet Below Land Surface.

ODS — Old Drum Storage AOC.

BH — Borehole.

### 6.3.2.2 SVOC Contamination

SVOC contamination in soil samples collected at the Old Drum Storage AOC are shown in Table 6.5. Eleven SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), were detected in two of the five soil samples collected at this AOC. Both of these soil samples were taken just below the surface and both were located in the grass-covered portion of this AOC.

**Table 6.5**  
**Semivolatile Organic Compounds Detected in Soil Samples**  
**Collected at the Old Drum Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

SVOC	Sample Location Number and Interval (Ft BLS)	
	ODS-001BH 0.0 - 1.0	ODS-003BH 0.0 - 0.8
Bis(2-ethylhexyl)phthalate ( $\mu\text{g}/\text{kg}$ )	1,267	660U
Pyrene ( $\mu\text{g}/\text{kg}$ )	6,412	11,182
Phenanthrene ( $\mu\text{g}/\text{kg}$ )	2,230	4,649
Fluoranthene ( $\mu\text{g}/\text{kg}$ )	4,029	7,726
Anthracene ( $\mu\text{g}/\text{kg}$ )	660U	1,071
Benzo(a)anthracene ( $\mu\text{g}/\text{kg}$ )	1,735	3,223
Chrysene ( $\mu\text{g}/\text{kg}$ )	2,712	5,126
Benzo(b)fluoranthene ( $\mu\text{g}/\text{kg}$ )	1,266	1,982
Benzo(k)fluoranthene ( $\mu\text{g}/\text{kg}$ )	1,085	1,621
Benzo(a)pyrene ( $\mu\text{g}/\text{kg}$ )	1,094	1,754
Indeno(1,2,3-c,d)pyrene ( $\mu\text{g}/\text{kg}$ )	798	1,011
Benzo(g,h,i)perylene ( $\mu\text{g}/\text{kg}$ )	1,037	1,381

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

SVOC – Semivolatile Organic Compound.

ODS – Old Drum Storage AOC.

BH – Borehole.

$\mu\text{g}/\text{kg}$  – micrograms per kilogram.

U – Compound analyzed for but not detected. Number indicates the detection limit.

The highest concentrations of all PAHs were detected in sample ODS-003BH (0.0 - 0.8 feet BLS). Pyrene was detected at a concentration of 11,182  $\mu\text{g}/\text{kg}$ , phenanthrene at 4,649  $\mu\text{g}/\text{kg}$ , fluoranthene at 7,726  $\mu\text{g}/\text{kg}$ , anthracene at 1,071  $\mu\text{g}/\text{kg}$ , benzo(a)anthracene at 3,223  $\mu\text{g}/\text{kg}$ , chrysene at 5,126  $\mu\text{g}/\text{kg}$ , benzo(b)fluoranthene at 1,982  $\mu\text{g}/\text{kg}$ , benzo(k)fluoranthene at 1,621  $\mu\text{g}/\text{kg}$ , benzo(a)pyrene at 1,754  $\mu\text{g}/\text{kg}$ , indeno(1,2,3-c,d)pyrene at 1,011  $\mu\text{g}/\text{kg}$ , and benzo(g,h,i)perylene at 1,381  $\mu\text{g}/\text{kg}$ . The same PAHs, with the exception of anthracene, were detected in sample ODS-001BH (0.0 - 1.0 feet BLS). In this sample, bis(2-ethylhexyl)phthalate was also detected at a concentration of 1,267  $\mu\text{g}/\text{kg}$ .

Total PAH concentrations detected were 40,727  $\mu\text{g}/\text{kg}$  and 22,397  $\mu\text{g}/\text{kg}$  in samples ODS-003BH (0.0 - 0.8 feet BLS) and ODS-001BH (0.0 - 1.0 feet BLS), respectively. Total PAH contamination per borehole for both the Old Drum Storage and Northwest Ditch AOCs is depicted in Figure 6.5.

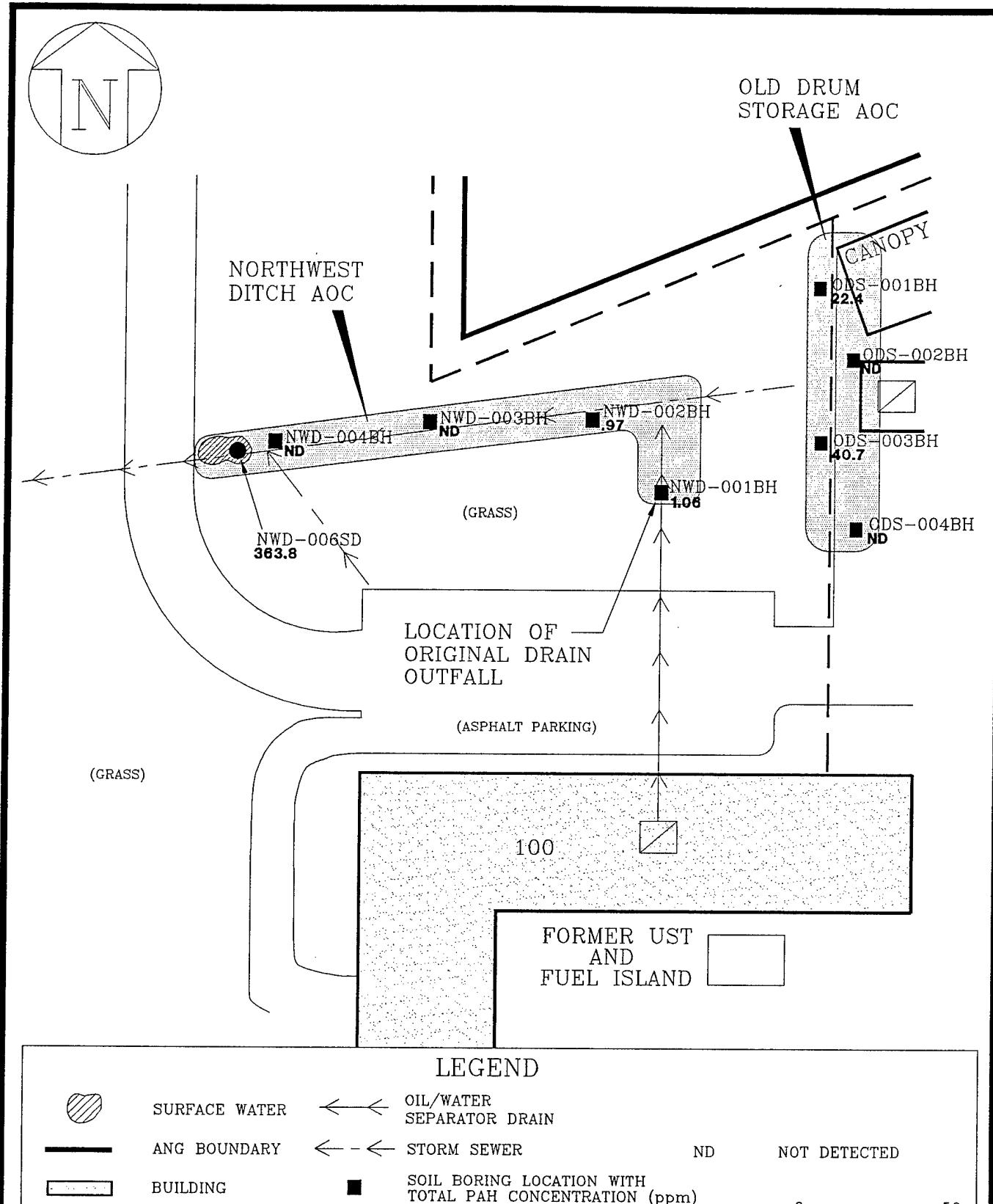


FIGURE 6.5

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TOTAL PAH LEVELS IN SURFACE SOILS AT THE OLD DRUM STORAGE AND NORTHWEST DITCH AOCs  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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### 6.3.2.3 Metals Contamination

Metals contamination in soils collected at the Old Drum Storage AOC is shown in Table 6.6. Ten of the 13 priority pollutant metals analyzed were detected in these soil samples. Selenium, silver, and thallium were not reported above detection limits in any of the samples.

**Table 6.6**  
**Metals Detected in Soil Samples**  
**Collected at the Old Drum Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Metal	Sample Location Number and Interval (Ft BLS)				
	ODS-001BH 0.0 - 1.0	ODS-001BH 4.0 - 5.0	ODS-002BH 1.0 - 1.8	ODS-003BH 0.0 - 0.8	ODS-004BH 0.0 - 1.0
Antimony (mg/kg)	3U	3U	3U	3U	3.68
Arsenic (mg/kg)	3.07	6.23	10.17	8.10	6.66
Beryllium (mg/kg)	0.24	0.51	0.26	0.96	0.50
Cadmium (mg/kg)	0.95	0.50U	0.72	1.00	0.75
Chromium (mg/kg)	5U	11.83	8.88	10.08	12.95
Copper (mg/kg)	26.19	11.76	6.26	10.88	10.07
Lead (mg/kg)	28.55	37.70	11.00	42.35	21.03
Mercury (mg/kg)	0.06	0.06	0.08	0.04	0.05
Nickel (mg/kg)	3.69	8.86	4.07	8.81	13.70
Zinc (mg/kg)	143.81	38.84	10.40	156.77	39.75

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

ODS – Old Drum Storage AOC.

BH – Borehole.

mg/kg – milligrams per kilogram.

U – Compound analyzed for but not detected. Number indicates the detection limit.

Antimony was detected at a concentration of 3.68 milligrams per kilogram (mg/kg) in sample ODS-004BH (0.0 - 1.0 feet BLS). Copper was detected at concentrations ranging from 6.26 to 26.19 mg/kg with the highest concentration detected in sample ODS-001BH (0.0 - 1.0 feet BLS). Arsenic and mercury were detected at concentrations ranging from 3.07 to 10.17 mg/kg and 0.04 to 0.08 mg/kg, respectively, with the highest concentrations detected in sample ODS-002BH (1.0 - 1.8 feet BLS). Beryllium, cadmium, lead, and zinc were detected at concentrations ranging from 0.24 to 0.96 mg/kg, 0.72 to 1.0 mg/kg, 11.0 to 42.35 mg/kg, and 10.40 to 156.77 mg/kg, respectively, with the highest concentrations detected in sample ODS-003BH (0.0 - 0.8 feet BLS). Chromium and nickel were detected at concentrations ranging from 8.88 to 12.95 mg/kg and 3.69 to 13.70 mg/kg, respectively, with the highest concentrations detected in sample ODS-004BH (0.0 - 1.0 feet BLS).

#### 6.3.2.4 TPH Contamination

TPH was not detected in any of the five soil samples collected at the Old Drum Storage AOC.

### 6.4 NORTHEAST AND EAST FENCE LINE AOC FINDINGS

A detailed description of this AOC, including the locations of soil borings, was given in Subsection 5.4.2.

#### 6.4.1 Field Screening Results

Nine subsurface soil samples were field screened with the Photovac 10S+ Portable GC as described in Section 5.2. The GC was calibrated to screen for BTEX. Table 6.7 summarizes the maximum concentrations of BTEX components detected in soil samples collected at the Northeast and East Fence Line AOC. Complete field GC data is presented in Appendix C.

**Table 6.7**  
**Maximum Field GC Concentrations Detected in Soil Samples**  
**Collected at the Northeast and East Fence Line AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Compound	Maximum Concentration Detected in Soil Samples (ppb)
Toluene	12.7
Ethylbenzene	25.1
Xylene	16.5

ppb – parts per billion.

AOC – Area of Concern.

GC – Gas Chromatograph.

Toluene, ethylbenzene, and xylenes were detected in all nine of the soil samples analyzed with the field GC. Toluene was detected at concentrations ranging from 0.1 to 12.7 ppb, ethylbenzene from 0.9 to 25.1 ppb, and xylenes from 0.4 to 16.5 ppb. The highest concentration of each of these components was detected in sample NEF-003BH (2.0 - 3.0 feet BLS); therefore, the highest total BTEX concentration of 54.3 ppb was at this same location.

#### 6.4.2 Nature of Soil Contamination

Five soil borings were installed at the Northeast and East Fence Line AOC, from which nine investigative samples were collected for laboratory analysis. The borings were installed and

samples collected on 24 February 1994. Sampling intervals submitted for laboratory analysis and the analytical program are presented in Table 6.8. A complete listing of laboratory results for all analyses at this AOC is given in Appendix E.

**Table 6.8**  
**Soil Sampling and Analytical Program for Northeast and East Fence Line AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Ft BLS)	Soil Analyses and Methods			
		VOCs (SW8240)	SVOCs (SW8270)	Metals (SW7000 series*)	TPH (Ca. Mod. 8015)
NEF-001BH	0.0 - 1.0	X	X	X	X
NEF-001BH	1.75 - 2.75	X	X	X	X
NEF-002BH	0.0 - 1.0	X	X	X	X
NEF-002BH	2.0 - 3.0	X	X	X	X
NEF-003BH	0.0 - 1.0	X	X	X	X
NEF-003BH	2.0 - 3.0	X	X	X	X
NEF-004BH	0.0 - 0.8	X	X	X	X
NEF-005BH	0.0 - 1.0	X	X	X	X
NEF-005BH	1.0 - 2.0	X	X	X	X

Ft BLS – Feet Below Land Surface.

VOCs – Volatile Organic Compounds.

SVOCs – Semivolatile Organic Compounds.

TPH – Total Petroleum Hydrocarbons.

\*Metals analyzed by SW7000 series methods as follows:

Antimony – SW7041.

Copper – SW7210.

Silver – SW7760.

Arsenic – SW7060.

Lead – SW7420.

Thallium – SW7840.

Beryllium – SW7090.

Mercury – SW7471.

Zinc – SW7950.

Cadmium – SW7130.

Nickel – SW7520.

Chromium – SW7190.

Selenium – SW7740.

NEF – Northeast Fence Line AOC.

BH – Borehole.

AOC – Area of Concern.

#### 6.4.2.1 VOC Contamination

VOCs detected in soil samples collected at the Northeast and East Fence Line AOC are presented in Table 6.9. No VOCs were detected in sample NEF-002BH (2.0 - 3.0 feet BLS). In the remaining eight samples, the VOCs m,p-xylanes, methylene chloride, and acetone were variously detected. M,p-xylanes were detected at concentrations of 7.38  $\mu\text{g}/\text{kg}$  and 7.85  $\mu\text{g}/\text{kg}$  in samples NEF-005BH (0.0 - 1.0 feet BLS) and NEF-005BH (1.0 - 2.0 feet BLS), respectively. Methylene chloride was detected in four samples at concentrations ranging from 15.42 to 17.02  $\mu\text{g}/\text{kg}$ , with the highest concentration detected in sample NEF-004BH (0.0 - 0.8 feet BLS). Acetone was detected at a concentration of 299  $\mu\text{g}/\text{kg}$  in sample NEF-003BH (0.0 - 1.0 feet BLS). Methylene chloride and acetone are common laboratory solvents and concentrations detected may reflect laboratory induced contamination.

**Table 6.9**  
**Volatile Organic Compounds Detected in Soil Samples**  
**Collected at the Northeast and East Fence Line AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Feet BLS)	Volatile Organic Compounds ( $\mu\text{g}/\text{kg}$ )		
		m,p-Xylenes	Methylene Chloride	Acetone
NEF-001BH	0.0 - 1.0	5U	15.42	100U
NEF-001BH	1.75 - 2.75	5U	15.77	100U
NEF-002BH	0.0 - 1.0	5U	15.69	100U
NEF-003BH	0.0 - 1.0	5U	5U	299
NEF-004BH	0.0 - 0.8	5U	17.02	100U
NEF-005BH	0.0 - 1.0	7.38	5U	100U
NEF-005BH	1.0 - 2.0	7.85	5U	100U

$\mu\text{g}/\text{kg}$  – micrograms per kilogram.

AOC – Area of Concern.

BLS – Below Land Surface.

NEF – Northeast Fence Line AOC.

BH – Borehole.

U – Compound analyzed for but not detected.

Number indicates the detection limit.

#### 6.4.2.2 SVOC Contamination

No SVOCs were detected in any of the nine soil samples collected at the Northeast and East Fence Line AOC.

#### 6.4.2.3 Metals Contamination

Metals contamination detected in soils collected at the Northeast and East Fence Line AOC are shown in Table 6.10. Twelve of the 13 priority pollutant metals analyzed were detected in these soil samples. Thallium was not reported above detection limits in any of the samples. Antimony and arsenic were detected at concentrations ranging from 6.01 to 16.37 mg/kg and 4.48 to 16.16 mg/kg, respectively, with the highest concentrations detected in sample NEF-003BH (2.0 - 3.0 feet BLS). Beryllium, mercury, nickel, and silver were detected at concentrations ranging from 0.22 to 0.77 mg/kg, 0.07 to 0.19 mg/kg, 3.36 to 24.21 mg/kg, and 0.71 to 0.73 mg/kg, respectively, with the highest concentrations detected in sample NEF-002BH (2.0 - 3.0). Cadmium, chromium, and selenium were detected at concentrations ranging from 0.53 to 1.4 mg/kg, 11.19 to 27.73 mg/kg, and 1.21 to 16.14 mg/kg, respectively, with the highest concentrations detected in sample NEF-005BH (1.0 - 2.0 feet BLS). Copper, lead, and zinc were detected at concentrations ranging from 5.37 to 26.8 mg/kg, 17.04 to 59.83 mg/kg, and 22.5 to 161.33 mg/kg, respectively, with the highest concentrations detected in sample NEF-002BH (0.0 - 1.0 feet BLS).

**Table 6.10**  
**Metals Detected in Soil Samples Collected at the Northeast and East Fence Line AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Metal	Sample Location Number and Interval (Ft BLS)						NEF-005BH 0.0 - 1.0	NEF-005BH 1.0 - 2.0
	NEF-001BH 0.0 - 1.0	NEF-001BH 1.75 - 2.75	NEF-002BH 0.0 - 1.0	NEF-002BH 2.0 - 3.0	NEF-003BH 0.0 - 1.0	NEF-003BH 2.0 - 3.0		
Antimony (mg/kg)	3U	6.01	11.47	6.05	10.64	16.37	10.26	9.90
Arsenic (mg/kg)	6.99	12.13	13.34	14.72	4.48	16.16	10.92	12.40
Beryllium (mg/kg)	0.22	0.37	0.58	0.77	0.34	0.51	0.34	10.44
Cadmium (mg/kg)	0.53	0.62	1.15	0.56	0.50U	0.50U	0.50U	0.44
Chromium (mg/kg)	5U	23.71	22.63	22.08	11.19	11.60	14.28	1.13
Copper (mg/kg)	10.47	5.44	26.80	20.37	6.14	5.37	14.51	1.40
Lead (mg/kg)	27.62	22.81	59.83	23.00	22.06	25.57	45.31	27.73
Mercury (mg/kg)	0.12	0.16	0.07	0.19	0.15	0.12	0.13	19.07
Nickel (mg/kg)	3.36	8.62	14.87	24.21	6.37	7.06	13.47	24.59
Selenium (mg/kg)	5.20	2.20	2.63	3.52	1.53	1.21	0.20U	17.04
Silver (mg/kg)	0.70U	0.70U	0.70U	0.73	0.70U	0.70U	0.70U	0.15
Zinc (mg/kg)	38.58	43.04	161.33	99.57	25.38	26.92	75.33	0.10
							29.31	5.75
								16.14
								0.71
								22.50

AOC - Area of Concern.

Ft BLS - Feet Below Land Surface.

NEF - Northeast Fence Line AOC.

BH - Borehole.

mg/kg - milligrams per kilogram.

U - Compound analyzed for but not detected. Number indicates the detection limit.

#### 6.4.2.4 TPH Contamination

TPH was not detected in any of the nine soil samples collected at the Northeast and East Fence Line AOC.

### 6.5 CURRENT TEMPORARY WASTE STORAGE AOC FINDINGS

A detailed description of this AOC, including the locations of soil borings and one surface soil sample, was given in Subsection 5.4.3.

#### 6.5.1 Field Screening Results

Five subsurface soil samples were field screened with the Photovac 10S+ Portable GC as described in Section 5.2. The GC was calibrated to screen for BTEX. Table 6.11 summarizes the maximum concentrations of BTEX components detected in soil samples collected at the Current Temporary Waste Storage AOC. Complete field GC data is presented in Appendix C.

**Table 6.11**  
**Maximum Field GC Concentrations Detected in Soil Samples**  
**Collected at the Current Temporary Waste Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Compound	Maximum Concentration Detected in Soil Samples (ppb)
Toluene	8.8
Ethylbenzene	17.0
Xylene	13.9

GC – Gas Chromatograph.

ppb – parts per billion.

AOC – Area of Concern.

Toluene, ethylbenzene, and xylenes were detected in all five of the samples analyzed with the field GC. Toluene and ethylbenzene were detected at concentrations ranging from 0.1 to 8.8 ppb and 2.4 to 17.0 ppb, respectively, with the highest concentrations detected in sample CTS-001BH (0.0 - 1.5 feet BLS). Xylenes were detected at concentrations ranging from 0.6 to 13.9 ppb, with the highest concentration detected in sample CTS-003BH (0.0 - 1.5 feet BLS). The highest concentration of total BTEX, 38.0 ppb, was detected in sample CTS-001BH (0.0 - 1.5 feet BLS).

## 6.5.2 Nature of Soil Contamination

Three soil borings were installed at the Current Temporary Waste Storage AOC, from which five investigative samples were collected for laboratory analysis. The borings were installed and samples collected on 24 February 1994. A single surface soil sample was also collected at the Current Temporary Waste Storage AOC. Sampling intervals submitted for laboratory analysis and the analytical program are presented in Table 6.12. A complete listing of laboratory results for all analyses at this AOC is given in Appendix E.

**Table 6.12**  
**Sampling and Analytical Program for Current Temporary Waste Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Matrix	Sample Depth (Ft BLS)	Analyses and Methods			
			VOCs (SW8240)	SVOCs (SW8270)	Metals (SW7000 series*)	TPH (Ca. Mod. 8015)
CTS-001BH	Soil	0.0 - 1.5	X	X	X	X
CTS-002BH	Soil	0.0 - 1.5	X	X	X	X
CTS-002BH	Soil	1.5 - 2.75	X	X	X	X
CTS-003BH	Soil	0.0 - 1.5	X	X	X	X
CTS-003BH	Soil	1.5 - 3.0	X	X	X	X
CTS-004SF	Surface Soil	NA	X	X	X	X

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

VOCs – Volatile Organic Compounds.

SVOCs – Semivolatile Organic Compounds.

TPH – Total Petroleum Hydrocarbons.

\*Metals analyzed by SW7000 series methods as follows:

Antimony – SW7041.

Arsenic – SW7060.

Beryllium – SW7090.

Cadmium – SW7130.

Chromium – SW7190.

Copper – SW7210.

Lead – SW7420.

Mercury – SW7471.

Nickel – SW7520.

Selenium – SW7740.

CTS – Current Temporary Waste Storage AOC.

BH – Borehole.

SF – Surface Soil.

NA – Not Applicable.

Ca. Mod. – California Modified.

Silver – SW7760.

Thallium – SW7840.

Zinc – SW7950.

### 6.5.2.1 VOC Contamination

VOCs detected in soil samples collected at the Current Temporary Waste Storage AOC are presented in Table 6.13. The VOCs m,p-xylenes, methylene chloride, acetone, and o-xylene were variously detected in all five subsurface soil samples submitted for laboratory analysis. No VOCs were detected in sample CTS-004SF. M,p-xylenes were detected in three samples at concentrations ranging from 7.25 to 10.85  $\mu\text{g}/\text{kg}$ , with the highest concentration detected in sample CTS-002BH (1.5 - 2.75 feet BLS). O-xylene was detected at a concentration of 5.32  $\mu\text{g}/\text{kg}$  in sample CTS-002BH (1.5 - 2.75 feet BLS). Methylene chloride was detected in three

**Table 6.13**  
**Volatile Organic Compounds Detected in Soil Samples**  
**Collected at the Current Temporary Waste Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Ft BLS)	Volatile Organic Compounds ( $\mu\text{g}/\text{kg}$ )			
		m,p-Xylenes	Methylene Chloride	Acetone	o-Xylene
CTS-001BH	0.0 - 1.5	5U	9.40	100U	5U
CTS-002BH	0.0 - 1.5	5U	5U	393	5U
CTS-002BH	1.5 - 2.75	10.85	5U	122	5.32
CTS-003BH	0.0 - 1.5	7.40	9.42	100U	5U
CTS-003BH	1.5 - 3.0	7.25	9.61	100U	5U

$\mu\text{g}/\text{kg}$  – micrograms per kilogram.

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

CTS – Current Temporary Waste Storage AOC.

BH – Borehole.

SF – Surface soil.

U – Compound analyzed for but not detected. Number indicates the detection limit.

samples at concentrations ranging from 9.40 to 9.61  $\mu\text{g}/\text{kg}$ , with the highest concentration detected in sample CTS-003BH (1.5 - 3.0 feet BLS) and acetone was detected at concentrations of 122  $\mu\text{g}/\text{kg}$  and 393  $\mu\text{g}/\text{kg}$  in samples CTS-002BH (1.5 - 2.75 feet BLS) and CTS-002BH (0.0 - 1.5 feet BLS), respectively. However, methylene chloride and acetone are common laboratory solvents and concentrations detected may reflect laboratory induced contamination.

#### 6.5.2.2 SVOC Contamination

SVOC contamination in soil samples collected at the Current Temporary Waste Storage AOC are shown in Table 6.14. Seventeen SVOCs, primarily PAHs, were detected in the surface soil sample CTS-004SF, while one SVOC was detected in one of the subsurface soil samples.

Significant concentrations of PAHs were detected in surface soil sample CTS-004SF. Pyrene was detected at a concentration of 114,372  $\mu\text{g}/\text{kg}$ , phenanthrene at 65,689  $\mu\text{g}/\text{kg}$ , fluoranthene at 75,269  $\mu\text{g}/\text{kg}$ , anthracene at 20,106  $\mu\text{g}/\text{kg}$ , benzo(a)anthracene at 26,676  $\mu\text{g}/\text{kg}$ , chrysene at 37,809  $\mu\text{g}/\text{kg}$ , benzo(b)fluoranthene at 15,831  $\mu\text{g}/\text{kg}$ , benzo(k)fluoranthene at 11,434  $\mu\text{g}/\text{kg}$ , acenaphthene at 5,652  $\mu\text{g}/\text{kg}$ , fluorene at 5,460  $\mu\text{g}/\text{kg}$ , benzo(a)pyrene at 14,027  $\mu\text{g}/\text{kg}$ , indeno(1,2,3-c,d)pyrene at 7,685  $\mu\text{g}/\text{kg}$ , benzo(g,h,i)perylene at 9,523  $\mu\text{g}/\text{kg}$ , naphthalene at 2,681  $\mu\text{g}/\text{kg}$ , 2-methylnaphthalene at 1,034  $\mu\text{g}/\text{kg}$ , and dibenzofuran at 2,363  $\mu\text{g}/\text{kg}$ . The total PAH concentration detected in sample CTS-004SF is 415,610  $\mu\text{g}/\text{kg}$ . The SVOC bis(2-ethylhexyl)phthalate was detected in samples CTS-003BH (0.0 - 1.5) and CTS-004SF at concentrations of 668  $\mu\text{g}/\text{kg}$  and 2,309  $\mu\text{g}/\text{kg}$ , respectively.

**Table 6.14**  
**Semivolatile Organic Compounds Detected in Soil Samples**  
**Collected at the Current Temporary Waste Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

SVOC	Sample Location Number and Interval (Ft BLS)	
	CTS-003BH 0.0 - 1.5	CTS-004SF Surface
Bis(2-ethylhexyl)phthalate (µg/kg)	668	2,309
Pyrene (µg/kg)	660U	114,372
Phenanthrene (µg/kg)	660U	65,689
Fluoranthene (µg/kg)	660U	75,269
Anthracene (µg/kg)	660U	20,106
Benzo(a)anthracene (µg/kg)	660U	26,676
Chrysene (µg/kg)	660U	37,809
Benzo(b)fluoranthene (µg/kg)	660U	15,831
Benzo(k)fluoranthene (µg/kg)	660U	11,434
Acenaphthene (µg/kg)	660U	5,652
Fluorene (µg/kg)	660U	5,460
Benzo(a)pyrene (µg/kg)	660U	14,027
Indeno(1,2,3-c,d)pyrene (µg/kg)	660U	7,685
Benzo(g,h,i)perylene (µg/kg)	660U	9,523
Naphthalene (µg/kg)	660U	2,681
2-Methylnaphthalene (µg/kg)	660U	1,034
Dibenzofuran (µg/kg)	660U	2,363

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

SVOC – Semivolatile Organic Compound.

CTS – Current Temporary Waste Storage AOC.

BH – Borehole.

SF – Surface soil.

µg/kg – micrograms per kilogram.

U – Compound analyzed for but not detected. Number indicates the detection limit.

#### 6.5.2.3 Metals Contamination

Metals contamination detected in soils collected at the Current Temporary Waste Storage AOC are shown in Table 6.15. Eleven of the 13 priority pollutant metals analyzed were detected in these soil samples. Silver and thallium were not reported above detection limits in any of the samples.

Arsenic was detected at concentrations ranging from 2.93 to 10.21 mg/kg, with the highest concentration detected in sample CTS-001BH (0.0 - 1.5 feet BLS). Selenium was detected at concentrations ranging from 0.26 to 9.44 mg/kg, with the highest concentration detected in sample CTS-002BH (0.0 - 1.5 feet BLS). Mercury was detected at concentrations ranging from 0.06 to 0.12 mg/kg, with the highest concentration detected in sample CTS-003BH (0.0 - 1.5 feet BLS). Antimony, beryllium, and nickel were detected at concentrations ranging from 0.35 to 12.34 mg/kg, 0.26 to 0.86 mg/kg, and 6.22 to 23.46 mg/kg, respectively, with the highest

**Table 6.15**  
**Metals Detected in Soil Samples**  
**Collected at the Current Temporary Waste Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Metal	Sample Location Number and Interval (Ft BLS)					
	CTS-001BH 0.0 - 1.5	CTS-002BH 0.0 - 1.5	CTS-002BH 1.5 - 2.75	CTS-003BH 0.0 - 1.5	CTS-003BH 1.5 - 3.0	CTS-004SF NA
Antimony (mg/kg)	3U	10.26	12.34	3U	0.35	3U
Arsenic (mg/kg)	10.21	5.63	8.40	5.32	2.93	9.72
Beryllium (mg/kg)	0.26	0.50	0.86	0.44	0.33	0.33
Cadmium (mg/kg)	0.57	0.90	0.68	1.53	1.55	5.18
Chromium (mg/kg)	8.61	14.83	16.31	6.94	9.53	20.69
Copper (mg/kg)	9.19	15.41	23.48	21.85	5.82	40.46
Lead (mg/kg)	15.87	17.67	26.93	11.38	17.29	54.89
Mercury (mg/kg)	0.11	0.09	0.11	0.12	0.11	0.06
Nickel (mg/kg)	7.86	18.02	23.46	6.22	6.46	10.20
Selenium (mg/kg)	0.26	9.44	0.73	0.20U	6.82	0.70U
Zinc (mg/kg)	27.27	61.75	74.55	22.92	25.76	601.59

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

CTS – Current Temporary Waste Storage AOC.

BH – Borehole.

SF – Surface soil.

mg/kg – milligrams per kilogram.

U – Compound analyzed for but not detected. Number

indicates the detection limit.

concentrations detected in sample CTS-002BH (1.5 - 2.75 feet BLS). Cadmium, chromium, copper, lead, and zinc were detected at concentrations ranging from 0.57 to 5.18 mg/kg, 6.94 to 20.69 mg/kg, 5.82 to 40.46 mg/kg, 11.38 to 54.89 mg/kg, and 22.92 to 601.59 mg/kg, respectively, with the highest concentrations detected in sample CTS-004SF.

#### 6.5.2.4 TPH Contamination

TPH was detected in both soil samples collected from boring CTS-003BH, as shown in Table 6.16. TPH was detected at concentrations of 21.25 mg/kg and 11.62 mg/kg in soil sampled from intervals 0.0 - 1.5 feet BLS and 1.5 - 3.0 feet BLS, respectively. TPH was not detected in any other samples at the Current Temporary Waste Storage AOC.

### 6.6 NORTHWEST DITCH AOC FINDINGS

A detailed description of this AOC, including the locations of soil borings, surface water, and sediment samples, was given in Subsection 5.4.4.

**Table 6.16**  
**TPH Detected in Soil Samples Collected**  
**at the Current Temporary Waste Storage AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Ft BLS)	TPH (mg/kg)
CTS-003BH	0.0 - 1.5	21.25
CTS-003BH	1.5 - 3.0	11.62

TPH – Total Petroleum Hydrocarbons.

CTS – Current Temporary Waste Storage

AOC – Area of Concern.

AOC.

Ft BLS – Feet Below Land Surface.

BH – Borehole.

mg/kg – milligrams per kilogram.

### 6.6.1 Field Screening Results

Five subsurface soil samples were field screened with the Photovac 10S+ Portable GC as described in Section 5.2. The GC, calibrated to screen for BTEX, did not detect BTEX compounds in the field-screened samples. Complete field GC data is presented in Appendix C.

### 6.6.2 Nature of Soil Contamination

Four soil borings were installed at the Northwest Ditch AOC, from which six investigative samples were collected for laboratory analysis. The borings were installed and samples collected on 25 February 1994. Sampling intervals submitted for laboratory analysis and the analytical program are presented in Table 6.17. A complete listing of laboratory results for all analyses at this AOC is given in Appendix E.

#### 6.6.2.1 VOC Contamination

VOCs detected in soil samples collected at the Northwest Ditch AOC are presented in Table 6.18. Methylene chloride was detected in five soil samples and acetone was detected in one soil sample. No VOCs were detected in sample NWD-003BH (0.0 - 1.0 feet BLS).

Methylene chloride was detected at concentrations ranging from 16.41 to 19.33  $\mu\text{g}/\text{kg}$ , with the highest concentration detected in sample NWD-004BH (0.0 - 1.0 feet BLS) and acetone was detected at a concentration of 342  $\mu\text{g}/\text{kg}$  in sample NWD-001BH (0.0 - 0.8 feet BLS). However, these contaminants are common laboratory solvents and may be laboratory induced.

**Table 6.17**  
**Sampling and Analytical Program for Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Matrix	Sample Depth (Ft BLS)	Analyses and Methods			
			VOCs (SW8240)	SVOCs (SW8270)	Metals (SW7000 series <sup>a</sup> )	TPH (Ca. Mod. 8015)
NWD-001BH	Soil	0.0 - 0.8	X	X	X	X
NWD-002BH	Soil	0.0 - 1.0	X	X	X	X
NWD-002BH	Soil	3.0 - 4.2	X	X	X	X
NWD-003BH	Soil	0.0 - 1.0	X	X	X	X
NWD-003BH	Soil	4.2 - 5.2	X	X	X	X
NWD-004BH	Soil	0.0 - 1.0	X	X	X	X
NWD-005SW	Water	NA	X	X	X	X
NWD-006SD	Sediment	NA	X	X	X	X

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

VOCs – Volatile Organic Compounds.

SVOCs – Semivolatile Organic Compounds.

TPH – Total Petroleum Hydrocarbons.

Ca. Mod. – California Modified.

<sup>a</sup>Metals analyzed by SW7000 series methods as follows:

Antimony – SW7041.

Arsenic – SW7060.

Beryllium – SW7090.

Cadmium – SW7130.

Chromium – SW7190.

Copper – SW7210.

Lead – SW7420.

Mercury – SW7471.

Nickel – SW7520.

Selenium – SW7740.

NWD – Northwest Ditch AOC.

BH – Borehole.

SW – Surface Water.

SD – Sediment.

NA – Not Applicable.

**Table 6.18**  
**Volatile Organic Compounds Detected in Soil Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Sample Depth (Ft BLS)	Volatile Organic Compounds (µg/kg)	
		Methylene Chloride	Acetone
NWD-001BH	0.0 - 0.8	16.84	342
NWD-002BH	0.0 - 1.0	16.41	100U
NWD-002BH	3.0 - 4.2	17.79	100U
NWD-003BH	4.2 - 5.2	18.23	100U
NWD-004BH	0.0 - 1.0	19.33	100U

µg/kg – micrograms per kilogram.

AOC – Area of Concern.

Ft BLS – Feet Below Land Surface.

NWD – Northwest Ditch AOC.

BH – Borehole.

U – Compound analyzed for but not detected. Number indicates the detection limit.

#### 6.6.2.2 SVOC Contamination

SVOCs were detected at the upper or surface interval at two of the four boring locations at the Northwest Ditch AOC, as shown in Table 6.19. Pyrene was detected at concentrations of 1,055  $\mu\text{g}/\text{kg}$  and 967  $\mu\text{g}/\text{kg}$  in samples NWD-001BH (0.0 - 0.8 feet BLS) and NWD-002BH (0.0 - 1.0 feet BLS), respectively.

**Table 6.19**  
**Semivolatile Organic Compounds Detected in Soil Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

SVOC	Sample Location Number and Interval (Ft BLS)	
	NWD-001BH 0.0 - 0.8	NWD-002BH 0.0 - 1.0
Pyrene ( $\mu\text{g}/\text{kg}$ )	1,055	967

AOC – Area of Concern.

NWD – Northwest Ditch AOC.

Ft BLS – Feet Below Land Surface.

$\mu\text{g}/\text{kg}$  – micrograms per kilogram.

SVOC – Semivolatile Organic Compound.

BH – Borehole.

#### 6.6.2.3 Metals Contamination

Metals contamination detected in soils collected at the Northwest Ditch AOC is shown in Table 6.20. Ten of the 13 priority pollutant metals analyzed were detected in these soil samples. Cadmium, silver, and thallium were not reported above detection limits in any of the samples.

Antimony was detected at a concentration of 5.31 mg/kg in soil sample NWD-001BH (0.0 - 0.8 feet BLS). Lead, nickel, and zinc were detected at concentrations ranging from 12.00 to 32.09 mg/kg, 4.80 to 12.06 mg/kg, and 16.89 to 87.46 mg/kg, respectively, with the highest concentrations detected in sample NWD-001BH (0.0 - 0.8 feet BLS). Chromium and copper were detected at concentrations ranging from 5.75 to 14.87 mg/kg and 5.41 to 23.53 mg/kg, respectively, with the highest concentrations detected in sample NWD-002BH (3.0 - 4.2 feet BLS). Arsenic, beryllium, mercury, and selenium were detected at concentrations ranging from 6.94 to 13.48 mg/kg, 0.35 to 0.91 mg/kg, 0.03 to 0.22 mg/kg, and 0.47 to 0.98 mg/kg, respectively, with highest concentrations detected in sample NWD-004BH (0.0 - 1.0 feet BLS).

#### 6.6.2.4 TPH Contamination

TPH was not detected in any of the six soil samples collected at the Northwest Ditch AOC.

**Table 6.20**  
**Metals Detected in Soil Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Metal	Sample Location Number and Interval (Ft BLS)				
	NWD-001BH 0.0 - 0.8	NWD-002BH 0.0 - 1.0	NWD-002BH 3.0 - 4.2	NWD-003BH 0.0 - 1.0	NWD-003BH 4.2 - 5.2
Antimony (mg/kg)	5.31	3U	12.22	3U	3U
Arsenic (mg/kg)	10.44	6.94	0.58	12.44	10.54
Beryllium (mg/kg)	0.50	0.36		0.36	0.35
Chromium (mg/kg)	10.93	8.72	14.87	11.54	10.51
Copper (mg/kg)	10.40	6.34	23.53	9.01	5.41
Lead (mg/kg)	32.09	20.23	31.28	29.98	10.24
Mercury (mg/kg)	0.06	0.03	0.09	12.00	12.08
Nickel (mg/kg)	12.06	8.15	9.68	0.04	0.22
Selenium (mg/kg)	0.20U	0.20U	0.20U	0.70	4.80
Zinc (mg/kg)	87.46	30.44	38.64	36.41	0.47
				25.77	0.98
					16.89

AOC - Area of Concern.

Ft BLS - Feet Below Land Surface.

NWD - Northwest Ditch AOC.

BH - Borehole.

mg/kg - milligrams per kilogram.

U - Compound analyzed for but not detected. Number indicates the detection limit.

### 6.6.3 Nature of Surface Water and Sediment Contamination

One surface water sample and one sediment sample were collected at the Northwest Ditch AOC on 25 February 1994. The analytical program for these two samples is included in Table 6.17. The field measurement results for the surface water sample included a temperature of 64.1° F, a specific conductance of 0.165 millimhos (mmhos), and a pH of 9.45. A complete listing of laboratory results for all analyses at this AOC is given in Appendix E.

#### 6.6.3.1 VOC Contamination

VOCs detected in surface water and sediment samples at the Northwest Ditch AOC are presented in Table 6.21. Methylene chloride was detected in both the surface water and sediment samples. Chloroform, trichloroethene, and toluene were also detected in the surface water sample. Methylene chloride was detected at concentrations of 224 micrograms per liter ( $\mu\text{g}/\text{L}$ ) in surface water sample NWD-005SW and at 18.14  $\mu\text{g}/\text{kg}$  in sediment sample NWD-006SD. Methylene chloride detected in these samples probably reflects laboratory induced contamination.

**Table 6.21**  
**Volatile Organic Compounds Detected in Sediment and Surface Water Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	Volatile Organic Compounds			
	Methylene Chloride	Chloroform	Trichloroethene	Toluene
NWD-005SW*	224	12.75	8.49	5.26
NWD-006SD†	18.14	5U	5U	5U

\*All analytes reported in micrograms per liter ( $\mu\text{g}/\text{L}$ ).

†All analytes reported in micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ).

AOC – Area of Concern.

NWD – Northwest Ditch AOC.

SW – Surface water.

SD – Sediment.

U – Compound analyzed for but not detected.

Number indicates the detection limit.

Chloroform was detected at a concentration of 12.75  $\mu\text{g}/\text{L}$ , trichloroethene at 8.49  $\mu\text{g}/\text{L}$ , and toluene at 5.26  $\mu\text{g}/\text{L}$  in surface water sample NWD-005SW.

#### 6.6.3.2 SVOC Contamination

SVOC contamination detected in the surface water and sediment samples collected at the Northwest Ditch AOC are shown in Table 6.22. Fifteen SVOCs, primarily PAHs, were

**Table 6.22**  
**Semivolatile Organic Compounds Detected in Sediment and Surface Water Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

SVOC	Sample Location Number	
	NWD-005SW*	NWD-006SD†
Bis(2-ethylhexyl)phthalate	1,554	2,917
Pyrene	10U	84,562
Phenanthrene	10U	50,468
Fluoranthene	10U	59,393
Anthracene	10U	50,122
Benzo(a)anthracene	10U	18,939
Chrysene	10U	29,882
Benzo(b)fluoranthene	10U	14,886
Benzo(k)fluoranthene	10U	11,081
Acenaphthene	10U	2,024
Fluorene	10U	2,687
Benzo(a)pyrene	10U	13,424
Indeno(1,2,3-c,d)pyrene	10U	9,180
Benzo(g,h,i)perylene	10U	11,322
Dibenzo(a,h)anthracene	10U	4,427
Dibenzofuran	10U	1,441

\*All analytes reported in micrograms per liter ( $\mu\text{g}/\text{L}$ ).

SW – Surface Water.

†All analytes reported in micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ).

SD – Sediment.

AOC – Area of Concern.

U – Compound analyzed for but not detected. Number

SVOC – Semivolatile Organic Compound.

indicates the detection limit.

NWD – Northwest Ditch AOC.

detected in sediment sample NWD-006SD, while one SVOC was detected in the surface water sample.

Significant concentrations of PAHs were detected in sediment sample NWD-006SD. Pyrene was detected at a concentration of  $84,562 \mu\text{g}/\text{kg}$ , phenanthrene at  $50,468 \mu\text{g}/\text{kg}$ , fluoranthene at  $59,393 \mu\text{g}/\text{kg}$ , anthracene at  $50,122 \mu\text{g}/\text{kg}$ , benzo(a)anthracene at  $18,939 \mu\text{g}/\text{kg}$ , chrysene at  $29,882 \mu\text{g}/\text{kg}$ , benzo(b)fluoranthene at  $14,886 \mu\text{g}/\text{kg}$ , benzo(k)fluoranthene at  $11,081 \mu\text{g}/\text{kg}$ , acenaphthene at  $2,024 \mu\text{g}/\text{kg}$ , fluorene at  $2,687 \mu\text{g}/\text{kg}$ , benzo(a)pyrene at  $13,424 \mu\text{g}/\text{kg}$ , indeno(1,2,3-c,d)pyrene at  $9,180 \mu\text{g}/\text{kg}$ , benzo(g,h,i)perylene at  $11,322 \mu\text{g}/\text{kg}$ , dibenzo(a,h)anthracene at  $4,427 \mu\text{g}/\text{kg}$ , and dibenzofuran at  $1,441 \mu\text{g}/\text{kg}$ . The total PAH concentration detected in sample NWD-006SD was  $363,838 \mu\text{g}/\text{kg}$ . The SVOC bis(2-ethylhexyl)phthalate was detected in samples NWD-005SW and NWD-006SD at concentrations of  $1,554 \mu\text{g}/\text{L}$  and  $2,917 \mu\text{g}/\text{kg}$ , respectively.

### 6.6.3.3 Metals Contamination

Metals contamination detected in sediment and surface water samples collected at the Northwest Ditch AOC are shown in Table 6.23. Eleven of the 13 priority pollutant metals analyzed were detected in the sediment and surface water samples. Antimony and selenium were not reported above detection limits in any of the samples.

**Table 6.23**  
**Metals Detected in Sediment and Surface Water Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Metal	Sample Location Number	
	NWD-005SW*	NWD-006SD <sup>†</sup>
Arsenic	0.002	9.77
Beryllium	0.007	0.40
Cadmium	0.03	6.04
Chromium	0.09	67.08
Copper	0.02	23.42
Lead	0.12	476.70
Mercury	0.006	0.09
Nickel	0.02U	11.32
Silver	0.022	0.70U
Thallium	0.11	10U
Zinc	0.11	416.40

\*All analytes reported in milligrams per liter (mg/L).

SW – Surface Water.

<sup>†</sup>All analytes reported in milligrams per kilogram (mg/kg).

SD – Sediment.

AOC – Area of Concern.

U – Compound analyzed for but not detected. Number

NWD – Northwest Ditch AOC.

indicates the detection limit.

Arsenic was detected at a concentration of 0.002 mg/L, beryllium at 0.007 mg/L, cadmium at 0.03 mg/L, chromium at 0.09 mg/L, copper at 0.02 mg/L, lead at 0.12 mg/L, mercury at 0.006 mg/L, silver at 0.02 mg/L, thallium at 0.11 mg/L, and zinc at 0.11 mg/L in surface water sample NWD-005SW. Arsenic was detected at a concentration of 9.77 mg/kg, beryllium at 0.40 mg/kg, cadmium at 6.04 mg/kg, chromium at 67.08 mg/kg, copper at 23.42 mg/kg, lead at 476.70 mg/kg, mercury at 0.09 mg/kg, nickel at 11.32 mg/kg, and zinc at 416.40 mg/kg in sediment sample NWD-006SD.

### 6.6.3.4 TPH Contamination

TPH was detected at a concentration of 1,300  $\mu$ g/L in surface water sample NWD-005SW, collected at the Northwest Ditch AOC, as shown in Table 6.24. TPH was not detected in sediment sample NWD-006SD, collected at the Northwest Ditch AOC.

**Table 6.24**  
**TPH Detected in Sediment and Surface Water Samples**  
**Collected at the Northwest Ditch AOC**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Sample Location Number	TPH
NWD-005SW	1,300 $\mu\text{g}/\text{L}$
NWD-006SD	10U mg/kg

TPH – Total Petroleum Hydrocarbons.

AOC – Area of Concern.

NWD – Northwest Ditch AOC.

SW – Surface Water.

SD – Sediment.

$\mu\text{g}/\text{L}$  – micrograms per liter.

mg/kg – milligrams per kilogram.

U – Compound analyzed for but not detected. Number indicates the detection limit.

## SECTION 7.0 CONCLUSIONS

### 7.1 SUMMARY

ANGRC/CEVR authorized OpTech to prepare a PA/SI Work Plan and conduct PA and SI activities at the 223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas. The PA was initiated by ANGRC and OpTech personnel in October 1993, during which four AOCs were identified for further investigation based on past waste handling and disposal practices. Field SI activities were conducted as outlined in the PA/SI Work Plan submitted to ANGRC in January 1994. The SI at the 223rd CBCS commenced on 23 February 1994 and was completed on 28 February 1994.

The field work at the 223rd CBCS was accomplished by completing the following tasks:

- Drilling 16 soil borings to determine whether contamination exists at each AOC;
- Collecting one surface water and one sediment sample to determine if contamination is being transported away from the Northwest Ditch AOC;
- Submitting a total of 28 samples for analysis of VOCs, SVOCs, priority pollutant metals, and TPH; and
- Surveying the location and elevation of all soil boring, surface soil, and sediment sampling points.

The evaluation of analytical results obtained for the 28 samples entails comparison to applicable, relevant and appropriate requirements (ARARs). The Arkansas DPC&E has set action levels for TPH and BTEX in soils at 100 ppm and 10 ppm, respectively. No such levels have been set by DPC&E for metals or PAHs in soil; DPC&E negotiates cleanup levels for these parameters on a case-by-case basis. DPC&E personnel have provided general guidance for evaluation of detected metals and PAH contamination (Kresse, 1994).

For metals contamination, this guidance indicates two methods which are suggested for comparison. First, metals contamination may be considered for cleanup if the concentrations are greater than ten times background concentrations. No background sampling was performed during the SI at Hot Springs ANGS. For comparison purposes, data from a United States Geological Survey (USGS) Report (Shacklette and Boerngen, 1984) which describes

naturally-occurring metals concentrations in soils in the eastern conterminous United States is used. Second, metals contamination may be evaluated by estimating a maximum concentration of a metal which may leach from a soil into a groundwater source, and then comparing this estimated value with maximum contaminant levels (MCLs) of the Federal Primary Drinking Water Standards (FPDWS). This estimate is obtained by dividing an observed metal concentration in soil by 2,000. This value is a multiplicative combination of two factors as follows – first, a maximum estimated toxic characteristic leaching procedure (TCLP) result is obtained by dividing the metals concentration by 20, this being the soil in water dilution factor used in the TCLP. The second factor of 100 represents an estimate of the aqueous dilution which would occur from leaching of a contaminated soil into a groundwater source.

For PAH or SVOC contamination, guidance from DPC&E includes the following: cleanup to background levels or cleanup to levels which, as justified by TCLP analyses, are protective of groundwater. Again, cleanup levels are negotiated on a case-by-case basis. Specifically, for PAH contamination, the Arkansas DPC&E has negotiated, to date, PAH cleanup levels with at least two private parties; these negotiated levels have been approximately several hundred parts per million total PAH.

## **7.2 OLD DRUM STORAGE AOC CONCLUSIONS**

### **7.2.1 Soil Contamination**

A single VOC compound, methylene chloride, was detected in all five soil samples collected at this AOC. The maximum detected concentration is 17.80  $\mu\text{g}/\text{kg}$ , and all five detected values are very close to this value. This analyte likely represents laboratory contamination, since common laboratory solvents such as acetone, methylene chloride, 2-butanone, and hexane are known to occur as false positive identifications in VOC analyses (USEPA, 1993).

SVOC contamination was detected in two of the five samples, ODS-003BH (0.0 - 0.8 feet BLS) and ODS-002BH (0.0 - 1.0 feet BLS). Virtually all SVOCs detected were PAHs. The highest concentration of all PAHs detected at this AOC were detected in sample ODS-003BH (0.0 - 0.8 feet BLS). Pyrene was detected at a concentration of 11,182  $\mu\text{g}/\text{kg}$ , phenanthrene at 4,649  $\mu\text{g}/\text{kg}$ , fluoranthene at 7,726  $\mu\text{g}/\text{kg}$ , anthracene at 1,071  $\mu\text{g}/\text{kg}$ , benzo(a)anthracene at 3,223  $\mu\text{g}/\text{kg}$ , chrysene at 5,126  $\mu\text{g}/\text{kg}$ , benzo(b)fluoranthene at 1,982  $\mu\text{g}/\text{kg}$ , benzo(k)fluoranthene at 1,621  $\mu\text{g}/\text{kg}$ , benzo(a)pyrene at 1,754  $\mu\text{g}/\text{kg}$ , indeno(1,2,3-c,d)pyrene at 1,011  $\mu\text{g}/\text{kg}$ , and benzo(g,h,i)perylene at 1,381  $\mu\text{g}/\text{kg}$ . The same PAHs, with the exception of anthracene, were detected in sample ODS-001BH (0.0 - 1.0 feet BLS). Total PAH concentrations detected were

40,727  $\mu\text{g}/\text{kg}$  and 22,397  $\mu\text{g}/\text{kg}$  in samples ODS-003BH (0.0 - 0.8 feet BLS) and ODS-001BH (0.0 - 1.0 feet BLS), respectively. Whether these total PAH levels are above cleanup standards will be determined on a case-by-case basis with DPC&E. Bis(2-ethylhexyl)phthalate was also detected at a concentration of 1,267  $\mu\text{g}/\text{kg}$  in sample ODS-001BH (0.0 - 1.0 feet BLS). The detection of bis(2-ethylhexyl) phthalate is attributable to laboratory contamination since phthalate esters are known to occur as false positives in SVOC analyses (USEPA, 1993).

The average and maximum concentrations of metals detected in soils collected at this AOC are presented in Table 7.1. These values are compared with reported naturally-occurring metals concentrations and with the TCLP-estimated action levels, which are obtained by multiplying FPDWS MCL values by 2,000, as described in Section 7.1. As seen in Table 7.1, the average concentration for lead exceeds the average naturally-occurring concentration, yet the average and maximum concentrations are within the observed range of naturally-occurring lead concentrations. None of the metals detected in soils exceed the TCLP-estimated action level.

No TPH contamination was detected in any of the five soil samples collected at the Old Drum Storage AOC.

### **7.3 NORTHEAST AND EAST FENCE LINE AOC CONCLUSIONS**

#### **7.3.1 Soil Contamination**

Two VOCs detected in soil samples, methylene chloride in five of nine soil samples at a maximum concentration of 17.02  $\mu\text{g}/\text{kg}$ , and acetone in one soil sample at 299  $\mu\text{g}/\text{kg}$ , likely represent laboratory false positive identifications, since these compounds are common laboratory solvents (USEPA, 1993). M,p-xylenes were detected in both soil samples collected from boring NEF-005BH at a maximum concentration of 7.85  $\mu\text{g}/\text{kg}$ . This concentration does not exceed the DPC&E limit of 10 ppm BTEX in soil.

No SVOC or TPH contamination was detected in any of the nine soil samples collected at the Northeast and East Fence Line AOC.

The average and maximum concentrations of metals detected in soils collected at this AOC are presented in Table 7.1. The average concentrations for arsenic, lead, mercury, and selenium exceed the average concentrations for naturally-occurring metals, yet, for arsenic, lead, and mercury, they are within the observed range of the respective naturally-occurring concentrations. None of the metals detected in soils exceed the TCLP-estimated action level.

**Table 7.1**  
**Comparison of Metals Detected in Soil Samples at Hot Springs ANGS to**  
**Naturally-Occurring Concentrations of Metals in Soils for the Eastern United States and TCLP-Estimated Action Levels**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

Metal	Number of Detects 26 Soil Samples	Statistical Summary for Metals Detected at Each AOC						Naturally-Occurring Metals Concentrations in Soils*			TCLP-Estimated Action Level (mg/kg)
		ODS AOC Avg.	NEF AOC Max.	CTS AOC Avg.	CTS AOC Max.	NWD AOC Avg.	NWD AOC Max.	Observed Range	FPDWS MCL (mg/l)		
Antimony (mg/kg)	13	3.68	10.48	16.37	7.65	12.34	5.31	ND	ND	ND	ND
Arsenic (mg/kg)	26	6.85	10.17	11.29	16.16	10.21	11.01	13.48	7.4	0.05	100
Beryllium (mg/kg)	26	0.49	0.96	0.43	0.77	0.45	0.86	0.51	0.85	<1 - 7	ND
Cadmium (mg/kg)	16	0.86	1.00	0.90	1.4	1.74	5.18	ND	1.5	0.01 - 45	0.005
Chromium (mg/kg)	24	10.94	12.95	18.86	27.73	12.82	20.69	10.39	14.87	52	1 - 1,000
Copper (mg/kg)	26	13.03	26.19	13.71	26.8	19.37	40.46	10.82	23.53	22	<1 - 700
Lead (mg/kg)	26	28.13	42.35	29.76	59.83	24.01	54.89	22.94	32.09	17	<10 - 300
Mercury (mg/kg)	26	0.058	0.08	0.132	0.19	0.100	0.12	0.080	0.22	0.12	0.01 - 3.4
Nickel (mg/kg)	26	7.83	13.70	10.18	24.21	12.04	23.46	8.65	12.06	18	<5 - 700
Selenium (mg/kg)	15	ND	ND	5.59	16.14	4.31	9.44	0.72	0.98	0.45	<0.1 - 3.9
Silver (mg/kg)	2	ND	ND	0.72	0.73	ND	ND	ND	ND	ND	0.01
Zinc (mg/kg)	26	77.91	156.77	58.00	161.33	150.42	601.59	39.27	87.46	ND	5.0

\*Source: Shacklette and Boerngen, 1984.

AOC – Area of Concern.

mg/l – milligrams per liter.

mg/kg – milligrams per kilogram.

ODS – Old Drum Storage AOC.

NEF – Northeast and East Fence Line AOC.

CTS – Current Temporary Waste Storage AOC.

NWD – Northwest Ditch AOC.

FPDWS – Federal Primary Drinking Water Standard.

TCLP – Toxic Characteristic Leaching Procedure.

MCL – Maximum Contaminant Level.

Avg. – Average.

Max. – Maximum concentration detected.

ND – No data available.

## 7.4 CURRENT TEMPORARY WASTE STORAGE AOC CONCLUSIONS

### 7.4.1 Soil Contamination

Two VOCs detected in soil samples, methylene chloride in three of six soil samples at a maximum concentration of 9.61  $\mu\text{g}/\text{kg}$ , and acetone in two of six soil samples at a maximum concentration of 393  $\mu\text{g}/\text{kg}$ , likely represent laboratory false positive identifications, since these compounds are common laboratory solvents (USEPA, 1993). M,p-xylenes were detected in both soil samples collected from boring CTS-003BH and in sample CTS-002BH (1.5 - 2.75 feet BLS) at a maximum concentration of 10.85  $\mu\text{g}/\text{kg}$ . O-xylene was detected in sample CTS-002BH (1.5 - 2.75 feet BLS) at a concentration of 5.32  $\mu\text{g}/\text{kg}$ . None of these xylene concentrations exceed the DPC&E limit of 10 ppm BTEX in soil.

SVOC contamination was detected in two of six soil samples, CTS-003BH (0.0 - 1.5 feet BLS) and CTS-004SF. Significant concentrations of PAHs were detected in surface soil sample CTS-004SF. Pyrene was detected at a concentration of 114,372  $\mu\text{g}/\text{kg}$ , phenanthrene at 65,689  $\mu\text{g}/\text{kg}$ , fluoranthene at 75,269  $\mu\text{g}/\text{kg}$ , anthracene at 20,106  $\mu\text{g}/\text{kg}$ , benzo(a)anthracene at 26,676  $\mu\text{g}/\text{kg}$ , chrysene at 37,809  $\mu\text{g}/\text{kg}$ , benzo(b)fluoranthene at 15,831  $\mu\text{g}/\text{kg}$ , benzo(k)fluoranthene at 11,434  $\mu\text{g}/\text{kg}$ , acenaphthene at 5,652  $\mu\text{g}/\text{kg}$ , fluorene at 5,460  $\mu\text{g}/\text{kg}$ , benzo(a)pyrene at 14,027  $\mu\text{g}/\text{kg}$ , indeno(1,2,3-c,d)pyrene at 7,685  $\mu\text{g}/\text{kg}$ , benzo(g,h,i)perylene at 9,523  $\mu\text{g}/\text{kg}$ , naphthalene at 2,681  $\mu\text{g}/\text{kg}$ , 2-methylnaphthalene at 1,034  $\mu\text{g}/\text{kg}$ , and dibenzofuran at 2,363  $\mu\text{g}/\text{kg}$ . The total PAH concentration in sample CTS-004SF is 415,610  $\mu\text{g}/\text{kg}$ . Based on guidance provided by DPC&E, this total PAH concentration may exceed action levels (see Table 7.2).

The detection of bis(2-ethylhexyl)phthalate at concentrations of 668  $\mu\text{g}/\text{kg}$  and 2,309  $\mu\text{g}/\text{kg}$  in samples CTS-003BH (0.0 - 1.5 feet BLS) and CTS-004SF, respectively, is attributable to laboratory contamination since phthalate esters are known to occur as false positives in SVOC analyses (USEPA, 1993).

The average and maximum concentrations of metals detected in soils collected at this AOC are presented in Table 7.1. The average concentrations for cadmium, lead, and selenium exceed the average concentrations for naturally-occurring metals, yet, for cadmium and lead, they are within the observed range of the naturally-occurring concentrations. None of the metals detected in soils exceed the TCLP-estimated action level.

**Table 7.2**  
**Summary of Analytes Exceeding Action Levels**  
**223rd CBCS, Hot Springs ANGS, Hot Springs, Arkansas**

AOC	Sample Location	Sample Matrix	Analyte	Concentration	Standard Exceeded	Action Level Concentration
NWD	NWD-005SW	Water	Cadmium	0.03 mg/L	FPDWS	0.005 mg/L
			Chromium	0.09 mg/L	FPDWS	0.05 mg/L
			Lead	0.12 mg/L	FPDWS	0.05 mg/L
			Mercury	0.006 mg/L	FPDWS	0.002 mg/L
			Trichloro-ethylene	8.49 $\mu$ g/L	FPDWS	5.0 $\mu$ g/L
	NWD-006SD	Sediment	Lead	476.70 mg/kg	TCLP	100 mg/kg
			Total PAH	363.8 mg/kg	DPC&E	NA
CTS	CTS-004SF	Surface soil	Total PAH	415.6 mg/kg	DPC&E	NA

AOC – Area of Concern.

NWD – Northwest Ditch AOC.

CTS – Current Temporary Waste Storage AOC.

SW – Surface Water.

SD – Sediment.

SF – Surface soil.

PAH – Polynuclear Aromatic Hydrocarbons.

mg/L – milligrams per liter.

$\mu$ g/L – micrograms per liter.

mg/kg – milligrams per kilogram.

FPDWS – Federal Primary Drinking Water Standard.

NA – Not Available.

TCLP – Estimation of minimum metal concentration in soil which could exceed FPDWS as estimated by Toxic Characteristics Leaching Procedure. The estimated value is 2,000 times the FPDWS.

DPC&E – Cleanup levels for total PAH are negotiated with the Arkansas Department of Pollution Control and Ecology.

TPH was detected at both sampling intervals (0.0 - 1.5 and 1.5 - 3.0 feet BLS) at boring CTS-003BH, at concentrations of 21.25 mg/kg and 16.61 mg/kg. These TPH concentrations do not exceed the DPC&E limit of 100 ppm TPH in soil.

## 7.5 NORTHWEST DITCH AOC CONCLUSIONS

### 7.5.1 Soil Contamination

Two VOCs detected in soil samples, methylene chloride in five soil samples at a maximum concentration of 19.33  $\mu$ g/kg, and acetone in one soil sample at 342  $\mu$ g/kg, likely represent laboratory false positive identifications, since these compounds are common laboratory solvents (USEPA, 1993). No other VOCs were detected in soil samples collected from the Northwest Ditch AOC.

The SVOC pyrene was detected at concentrations of 1,055  $\mu\text{g}/\text{kg}$  and 967  $\mu\text{g}/\text{kg}$  in samples NWD-001BH (0.0 - 0.8 feet BLS) and NWD-002BH (0.0 - 1.0 feet BLS), respectively. These low levels of PAH compounds likely do not exceed DPC&E action levels.

The average and maximum concentrations of metals detected in soils collected at this AOC are presented in Table 7.1. The average concentrations for arsenic and lead exceed the average concentrations for naturally-occurring metals, yet, they are within the observed range. None of the metals detected in soils exceed the TCLP-estimated action level.

No TPH was detected in soil samples collected at the Northwest Ditch AOC.

### **7.5.2 Surface Water and Sediment Contamination**

The detection of the VOC methylene chloride in both surface water sample NWD-005SW and sediment sample NED-006SD at concentrations of 224  $\mu\text{g}/\text{L}$  and 18.14  $\mu\text{g}/\text{kg}$ , respectively, likely represents laboratory false positive identification since methylene chloride is a common laboratory solvent (USEPA, 1993). Chloroform was also detected at a concentration of 12.75  $\mu\text{g}/\text{L}$ , trichloroethene at 8.49  $\mu\text{g}/\text{L}$ , and toluene at 5.26  $\mu\text{g}/\text{L}$  in surface water sample NWD-005SW. The trichloroethene concentration exceeds the FPDWS MCL of 5.0  $\mu\text{g}/\text{L}$ ; the chloroform and toluene concentrations do not exceed FPDWS MCLs of 0.1 mg/L and 1.0 mg/L, respectively.

The detection of bis(2-ethylhexyl)phthalate at concentrations of 1,554  $\mu\text{g}/\text{L}$  and 2,917  $\mu\text{g}/\text{kg}$  in samples NWD-005SW and NWD-006SD, respectively, is attributable to laboratory contamination since phthalate esters are known to occur as false positives in SVOC analyses (USEPA, 1993).

PAHs were detected in sediment sample NWD-006SD. Pyrene was detected at a concentration of 84,562  $\mu\text{g}/\text{kg}$ , phenanthrene at 50,468  $\mu\text{g}/\text{kg}$ , fluoranthene at 59,393  $\mu\text{g}/\text{kg}$ , anthracene at 50,122  $\mu\text{g}/\text{kg}$ , benzo(a)anthracene at 18,939  $\mu\text{g}/\text{kg}$ , chrysene at 29,882  $\mu\text{g}/\text{kg}$ , benzo(b)fluoranthene at 14,886  $\mu\text{g}/\text{kg}$ , benzo(k)fluoranthene at 11,081  $\mu\text{g}/\text{kg}$ , acenaphthene at 2,024  $\mu\text{g}/\text{kg}$ , fluorene at 2,687  $\mu\text{g}/\text{kg}$ , benzo(a)pyrene at 13,424  $\mu\text{g}/\text{kg}$ , indeno(1,2,3-c,d)pyrene at 9,180  $\mu\text{g}/\text{kg}$ , benzo(g,h,i)perylene at 11,322  $\mu\text{g}/\text{kg}$ , dibenzo(a,h)anthracene at 4,427  $\mu\text{g}/\text{kg}$ , and dibenzofuran at 1,441  $\mu\text{g}/\text{kg}$ . The total PAH concentration detected in sample NWD-005SD was 363,838  $\mu\text{g}/\text{kg}$ . Based on guidance provided by DPC&E, this total PAH concentration may exceed action levels (see Table 7.2).

Several metals were detected in the surface water and sediment samples at concentrations which exceed action levels. In sample NWD-005SW, cadmium was detected at a concentration of 0.03 mg/L, chromium at 0.09 mg/L, lead at 0.12 mg/L and mercury at 0.006 mg/L, which exceed FPDWS MCLs of 0.005 mg/L, 0.05 mg/L, 0.05 mg/L and 0.002 mg/L, respectively (see Table 7.2). Also, the lead concentration in sediment sample NWD-006SD at 476.7 mg/kg exceeds the TCLP-estimated action level of 100 mg/kg.

TPH was detected in surface water sample NWD-005SW at 1,300  $\mu\text{g}/\text{L}$ ; there is no FPDWS MCL for comparison.

## **SECTION 8.0 RECOMMENDATIONS**

### **8.1 OLD DRUM STORAGE AOC RECOMMENDATIONS**

Based on the results of the PA/SI conducted, further investigation is warranted to determine the areal extent of PAH contamination at the Old Drum Storage AOC.

### **8.2 NORTHEAST AND EAST FENCE LINE AOC RECOMMENDATIONS**

Based on the results of the PA/SI conducted, no contamination above action levels was identified. Therefore, no additional investigative efforts are warranted at the Northeast and East Fence Line AOC.

### **8.3 CURRENT TEMPORARY WASTE STORAGE AOC RECOMMENDATIONS**

Based on the results of the PA/SI conducted, only one surface soil sample contained concentrations of PAH contamination that may exceed State action levels at the Current Temporary Waste Storage AOC. Since this is a single point of contamination and does not represent widespread contamination at the site, no additional investigative efforts are warranted at the Current Temporary Waste Storage AOC.

### **8.4 NORTHWEST DITCH AOC RECOMMENDATIONS**

Based on the results of the PA/SI conducted, further investigation is warranted to determine the extent of PAH contaminated soil at the Northwest Ditch AOC. Additionally, the source and extent of cadmium, chromium, lead, mercury, and trichloroethene concentrations detected in surface water and sediments within the ditch at location NWD-005SW/NWD-006SD should be investigated.

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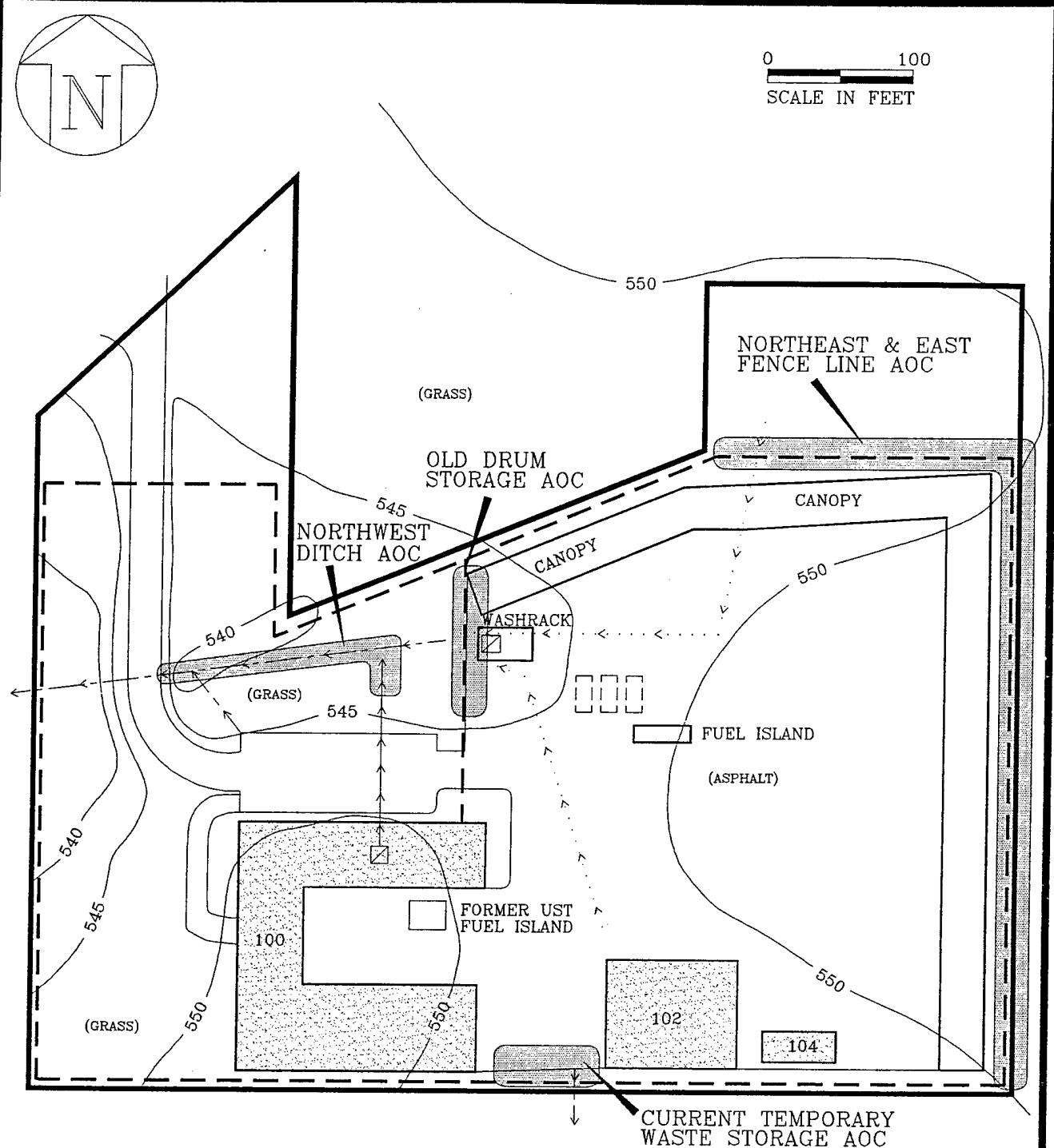
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**LEGEND**

— ANG BOUNDARY	<input type="checkbox"/>	OIL/WATER SEPARATOR	← →	STORM SEWER
 BUILDING		← →	OIL/WATER SEPARATOR DRAIN	↔ ↔ ↔ ↔ FRENCH DRAIN
— — FENCE				
 AREA OF CONCERN	<input type="checkbox"/>	UST	/550/	TOPOGRAPHIC CONTOUR LINES

SOURCE: 223rd CBCS MAP, 1993.

INSIDE  
BACK  
COVER  
HOTSPRNG\INBACK

STATION AREAS OF CONCERN  
223rd CBCS, Hot Springs ANGS  
Hot Springs, Arkansas

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JULY 1995